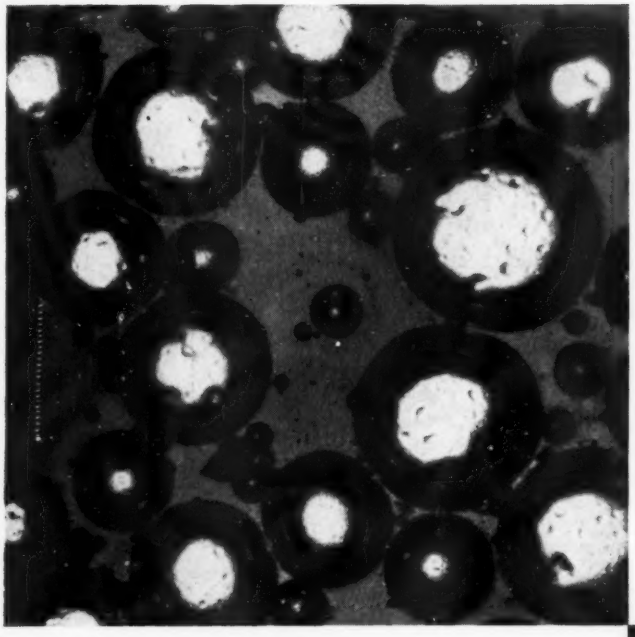
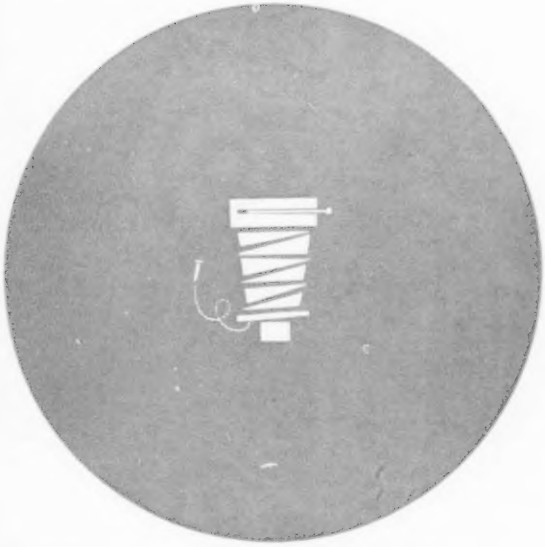
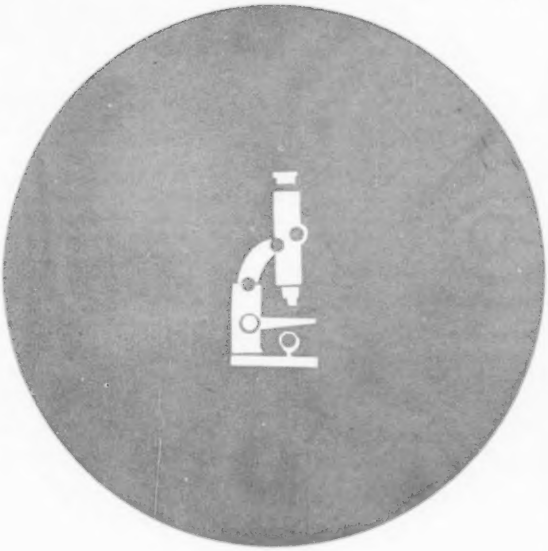
PMI

VOL. 1 NO. 5
MAY • 1958
PRICE 50¢

PHOTO METHODS FOR INDUSTRY







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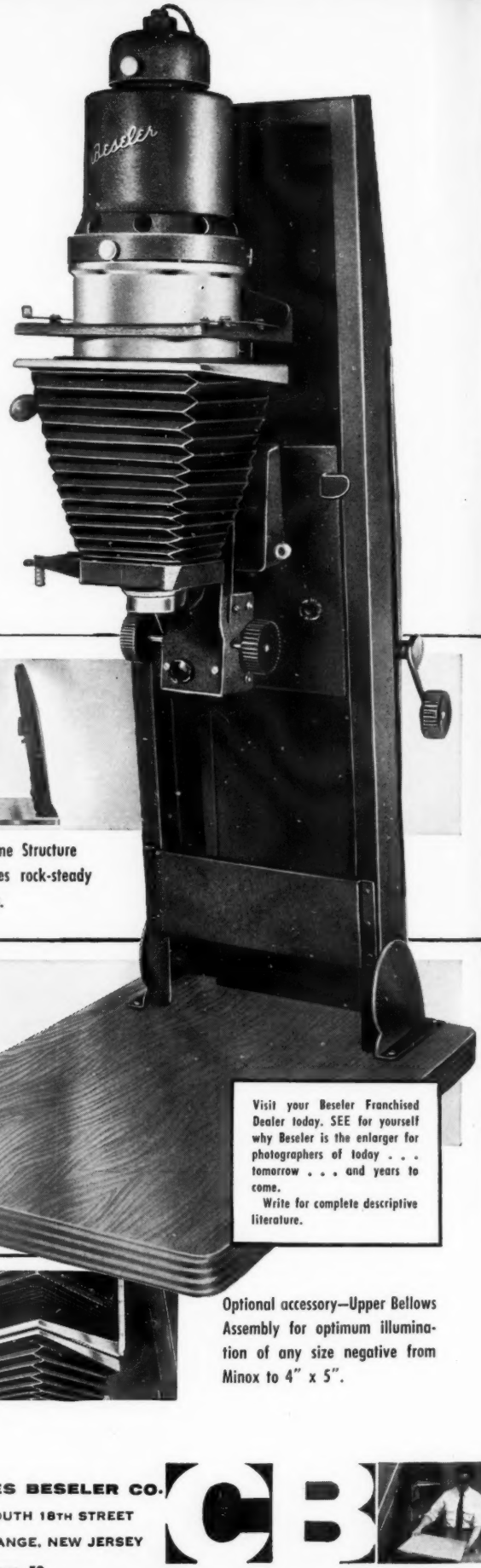
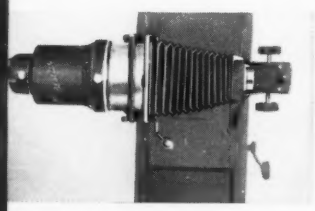
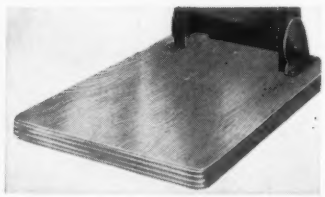




Horizontal Projection to right or left at precisely 90° for giant mural enlargements.



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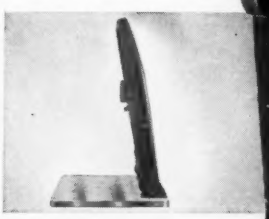
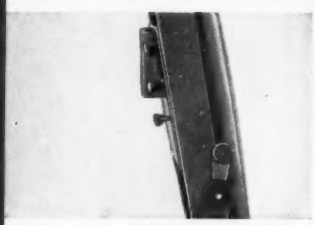


New Frame Structure guarantees rock-steady operation.



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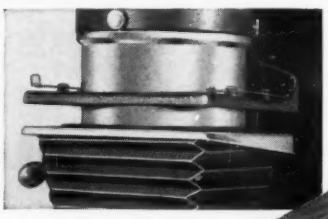

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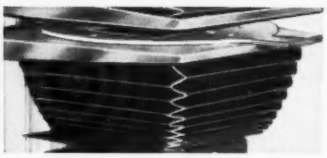
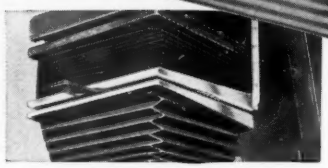


Controlled Tension Negative Stage locks simply . . . swiftly . . . into a light-tight unit.



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Get more information. Circle 405, page 59

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When a fast picture makes the difference (and you know how often it does), this is the *only* camera to use.

With the Polaroid Land Camera, the finished print is in your hands 60 seconds after you shoot it. In a matter of minutes you can have that all-important picture in the hands of the people concerned.

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Write for free booklet "How 60-Second Photography Can Help You In Your Business," or if you have a specific problem we can send you a case history from our file of the Polaroid Land Camera in use in over 400 business applications.

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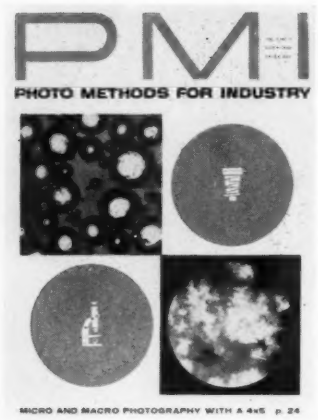
MAY, 1958

VOL. 1 NO. 5



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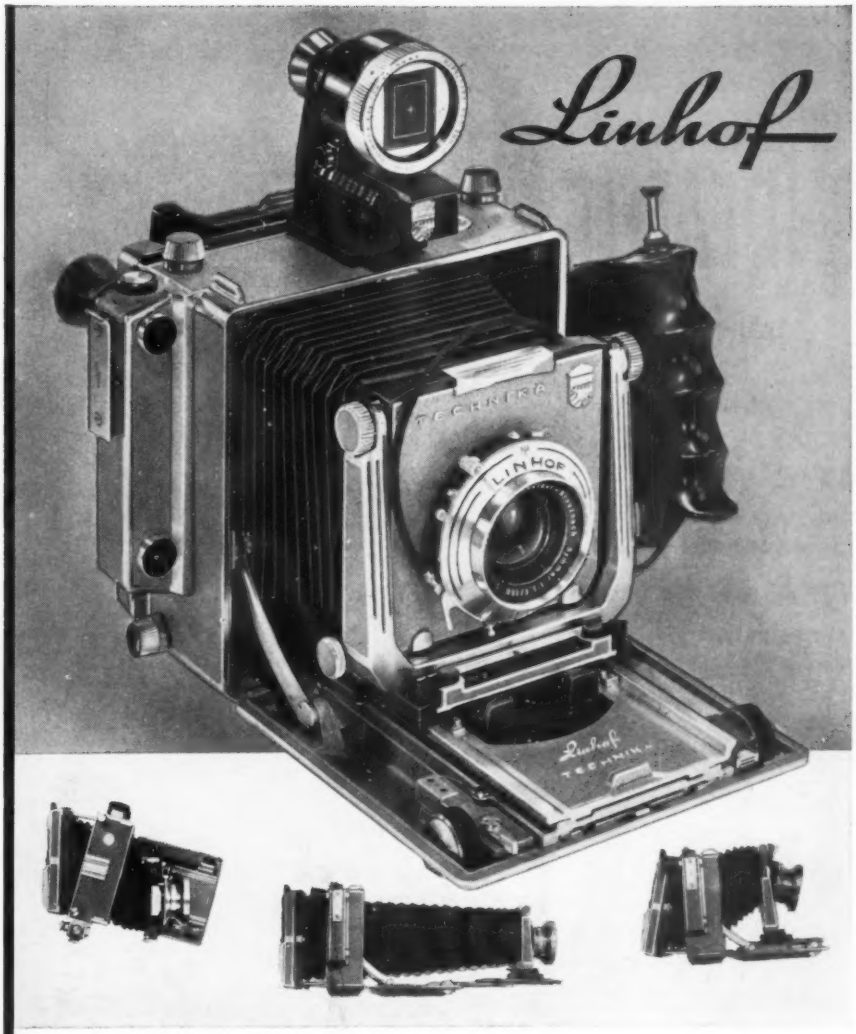

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Read GROSSBILD TECHNIK magazine and LINHOF PRACTICE, the encyclopedia of large-format photography.

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F.Y.I.

One can learn a lot from catalogs. In neat, tabular form a catalog gives the completest possible picture of "what's around." It can be the most stimulating reading in the world to a man in search of ideas.

For a great big 30¢ the Superintendent of Documents, U. S. Government Printing Office, will send you "Motion Pictures of the U. S. Department of Agriculture," a 59-page book describing all films currently distributed by the Department, and how they may be obtained. These shorts are practically a school of techniques of the modern informational film.

Science notes

Specializing only in developing reversal films for professionals, New York's Lab TV has just installed some highly ingenious gadgetry which all add up to quality control. Among the wonders are: a constant replenishing system, interlocked between all developing machines and regulated by the amount of footage being developed and an electronic temperature control which will hold development temperatures in all machines to within 1/10 of a degree. Just to show the robots who's boss, though, Jack Asher's snoopers still make hourly sensitometric tests!

Speaking of labs, Technicolor New York is now offering a special Kodachrome Processing Service, either 4½-hr., or for gentlemen of leisure, overnight. There is a special Saturday, Sunday and holiday service, too —for the opulent.

The Minnesota Mining and Manufacturing Co. who own all those Scotch Tape mines up there in Minnesota, have just released details of the magnetic tape they supply to record signals from sputniks.

Robert L. Westbee, V. P. of the firm's Magnetic and Electrical Products Division, describes the tape as "½-in. wide by 2500 ft. long, recording seven channels at a speed of 30 in. per sec. on instrumentation-type magnetic recorders." It has a maroon, high potency magnetic oxide coated on a 1.5-mil polyester film base, to a thickness of .35 mils.

Three of the seven channels are for telemetered data, three others for timing information and the seventh held in reserve.

Two of the three data channels record directly, while the third uses pulse-width recording for most accurate signal reproduction, reception conditions permitting.

Of the three timing channels, one records a precision standard frequency for pulse-width measurements, the second, a coded time signal and the third, synchronizing signals for playback speed adjustments.

Hi-speed clinic

We are reserving June 2-5 for a look-in at Fairchild's High Speed Motion Picture Photography Clinic, which will be held at the firm's Industrial Camera Division Plant, 5 Aerial Way, Syosset, L. I., N. Y.

Featuring a real free-and-easy atmosphere (no tuition—attend any one or all sessions) the course will be conducted under the direction of John H. Waddell, author of *Photographic Motion Analysis*. It is addressed to: "experts who wish to expand their knowledge, learn the latest in techniques and equipment; casuals—who have worked in high-speed photography but want to know more of the art; newcomers—who would like an introduction to movie making at rates up to 8,000 pictures a second."

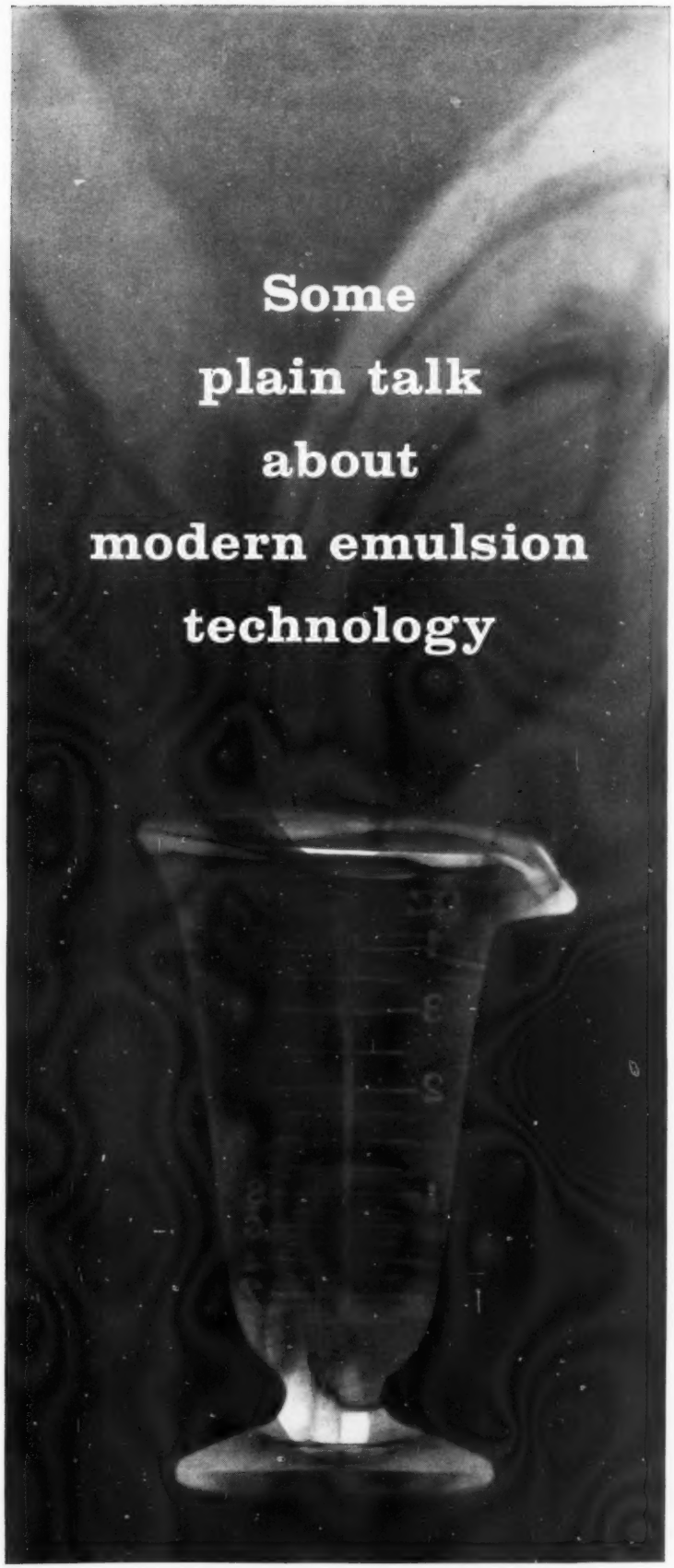
Do-it-yourself

You don't need a fancy jet to bust the sound barrier—all you need is a whip or a bit of frayed clothesline. The cracking noise is the well-known barrier getting broken. Prof. Edgerton has photographed the whole business.

Photo method in use

We don't recommend this exactly, but it's a new and fairly original application of photography and merits reporting. Seems there was this guy in Memphis who was using a 1:1 portrait of his wife to practice target shooting on. He was trying to hit her between the eyes, he said.

Practice makes perfect. When she came down cellar to try to make him stop, he shot her—right between the eyes!



Films are very different today than they were just a few years ago. (As if you haven't noticed!)

For example: a resolving power of 55 lines was considered normal even for relatively slow, fine grain emulsions. And these same emulsions had to be developed in slow, staining developers that lost both emulsion speed and resolution if large high quality prints were to be made. Even then, results were far from today's present high standards of brilliance, sharpness and gradation.

What happened?

Well, a new method of manufacturing emulsions was developed by Ansco that permitted increases in speed and resolution with no sacrifice in grain or tonal range.

Take Ansco's Super Hypan as an example. Optimum film speed—500 to 1000 or even more with extended development in such clean working, long life developers as Ansco Isodol. Resolving power? 90 lines! Better than the slow speed films had just a few years ago.

This new method of film making also resulted in greater latitude which naturally means cleaner highlights and more shadow detail under studio or available light conditions. Sheet, rolls or 35mm are all coated with the same emulsion. No need to handle miniature negatives any differently than sheet film negatives.

If you haven't as yet had an opportunity to streamline your operation in keeping with the new trends in emulsion technology, do so now by switching to Super Hypan.

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GRAPHIC* 45's

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Triple-Purpose Coupled Rangefinder

ONE of the outstanding features of the new Super Graphic is the triple-purpose coupled rangefinder. This distinctly new focusing device gives the critical photographer greatly expanded flexibility found in no other camera. It is an integral part of the camera, built in and positioned for utmost convenience and operating ease.

This advanced, new rangefinder permits (1) Precision optical focusing for critical work; (2) accurate dial focusing for fast camera operation; and (3) automatic indication of f-numbers for correct flash exposures.

The rangefinder operates by means of interchangeable cams which are matched to the measured focal length of any normal, wide angle or telephoto lens. These cams are extra-large, easy to handle and can be inserted in a second's time. The same cams also operate the Focusing Scale Indicator and Automatic Flash Computer located on top of the camera.

1 FULL 360° REVOLVING BACK
This new feature has click stops for horizontal and vertical positions. Double-cam-action sliding locks firmly grip Grafmatic, Roll Holder, Polaroid Back and Film Pack Adapter. Film holders can be inserted from top, bottom, right or left, for utmost convenience.

2 Great flexibility of all movements to adjust composition and depth of field. Front lens standard tilts forward and back, swings right and left, rises and drops, shifts right and left.

3 Forward tilting lensboard and drop bed combine for 27° tilt. Increases apparent depth of field when taking pictures from a balcony, up a flight of stairs or in similar situations. Drop bed also accommodates wide angle lenses.

4 Lateral swing increases apparent depth of field when photographing some types of subjects. Can be used in combination with all other tilts, swings and shifts to correct optical distortion, parallelism and composition.

5 Built-in BC circuit with self-contained batteries for electrical shutter release. Conveniently located electric body release button. With Graflite and Stroboflash accessories you trip electrically with either hand at the camera or remotely.

6 Automatic focusing scale indicator is located conveniently on top of the camera. This one scale matches any lens you use on the camera. Combines with flash exposure calculator; just set dial for guide number, focus camera and read correct f-number setting indicated by pointer.

7 Super Graphic Presslok Tripod Mount (accessory) fits any tripod and can be left permanently attached. Twin keyhole locks provide for instantaneous, fumble-free mounting of camera. Assures rigidity. Camera cannot be accidentally released.

8 Any wide angle, normal or telephoto lens and shutter suitable for a 4x5 camera can be mounted on a Super Graphic lensboard assembly. This assembly includes all internal connections for flash synchronization and electric shutter tripping. Lock lensboard in place and all connections are complete.

9 Concealed wires connect electric shutter release button, shutter and three-prong outlet for flash connector cord. This eliminates dangling wires on the lens standard and permits opening and closing of the camera without disconnecting the flash.

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Get more information. Circle 463, page 59

by Herbert P. Paschel

GRAPHIC ARTS & REPRODUCTION

Paraphernalia of platemaking from fresh eggs to automation

Not too long ago, bichromate-albumin coatings were used almost exclusively in making an offset plate. And it was not uncommon to prepare the light-sensitive coating from fresh eggs from the neighborhood grocery. The offset platemaker of today has a seemingly limitless selection in methods and materials. The choice ranges from the traditional method to a completely automatic, electromechanical method. The following outline summarizes current duplicator and offset platemaking techniques.

Conventional methods

Proprietary solutions for preparing and finishing offset plates—sensitizers, etches, lacquers, gum solutions, etc.—are available in countless numbers. Surface plates, so-called because the coating becomes the actual printing image, are exposed from negatives. Although albumin is still used as the colloid, many coating solutions are based on casein, light-sensitive resins and plastics, and natural and synthetic gums. While the prepared solutions, in general, provide improved image quality and durability, they do not change the traditional platemaking operations—coating, exposing, inking, developing and finishing. But in one respect a slight change has been introduced. Instead of coating a plate in a whirler, some solutions can be applied by dipping, spraying and brushing techniques. And a few of the solutions even permit pre-coating plates days and weeks in advance of use.

Deep-etch plates, in which the printing image is anchored below the metal surface, are exposed from positives. The sensitive coating serves merely as a stencil for the deep-etching operation and deposition of the lacquer image. In comparison with most surface plates, deep-etch plates offer longer press life coupled with a high image quality and resolution. Use of the deep-etch process is justified only if a one-time run exceeds 25,000 impressions, or if a plate is to re-run often over an extended period.

The advantages of the "do-it-yourself" are many and varied. The wide choice of materials (brands and types) makes it possible to evolve a platemaking technique to suit most any requirement. There is no limit on plate size nor any restriction on plate metal—zinc, aluminum and stainless steel may be used (with compatible solutions). In most cases, deletions and additions in local areas are possible.

Presensitized plates

One of the most significant developments has been in presensitized plates, i.e., plates coated during manufacture and ready for use without prior preparation. With such materials, a plate can be exposed and put on the press in ten minutes or less. The majority of the presensitized plates consist of a diazo sensitizer coated on an aluminum or paper base. Plasticized paper and plastic-paper laminates are also used as base material as are a number of other sensitizers. Negative and positive working plates are available in some brands. The basic advantages are—simplified and abbreviated platemaking operations, less equipment and working space needed, reduced chemical inventory, minimum skills and experience required, plates ready for instant use with a shelf life of six months or better.

Multi-metal plates

A dozen or so platemaking processes are based on the use of metals

with opposite properties, i.e., an ink receptive metal for the image, an ink repellent metal for the non-image areas. Copper and bronze are the usual image metals while aluminum, steel, stainless steel, nickel or chromium serve as the water carrier. The platemaking operations are more involved and more critical than with conventional plates, with consequent higher overall costs. Multi-metal plates are generally not available in duplicator sizes. The chief advantages are in image quality, resolution and durability.

Electro-static platemaking

From original copy to paper master, in three minutes, is the unique operating speed of Haloid's Xerographic platemaking method. A completely dry process, it does not require a film negative or the usual chemicals. Briefly described, an electrically charged, photoconductive plate is exposed to the original in the Xerox camera in a matter of seconds. The exposed plate is then developed with a dry powder which adheres only to the positive image on the plate. The powder image is transferred to a paper master and then bonded by heat treatment.

Cameraless platemaking

Two direct-from-original platemaking methods are offshoots of currently popular photo-copying systems based on the reflex principle. With Kodak's Verifax process, an offset plate is obtained by the physical transfer of an image from a matrix. In A. B. Dick's method, a printing image is created by chemical transfer. (See PMI, February 1958, page 18, for detailed descriptions of these systems). From original to plate takes just a few minutes. Equipment is simple, compact, low in cost, and can serve for office copying as well.

Electronic platemaking

The Time Stenafax machine is a rotary scanning device which produces duplicator plates direct from original line and halftone (prescreened) copy. The copy and a blank Planafax plate are mounted on two synchronized, rotating drums. Following loading, the operation is entirely automatic and takes about six minutes. A scanning head analyzes the tones of the copy. The reproducing head generates a high frequency spark which makes the Planafax plate ink receptive in accordance with the image areas of the copy. The machine also makes mimeograph stencils. THE END

Precision ground Kern Prism with LARGE viewing WINDOW renders strikingly brilliant, reinverted Lifesize image, in all its natural colors.

Alignment of Split-image Prism Rangefinder, built into groundglass gives critical focus. Surrounding clear zone is for viewing and photomicrography.

Single window contains both Rangefinder and Multifocal Viewfinder.

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by LLOYD E. VARDEN

PHOTO METHODS FOR TOMORROW

Photochemistry of glucose glass, intensifying by polymerization

One never knows in advance just where scientific discoveries will be made that will contribute to progress in photorecording. This is the basic stimulus which drives researchers in their efforts to improve photographic materials and makes their lives exciting despite frequent failures.

Photo reactions of dyes

On Friday, March 14, the New York Section of the American Chemical Society held all-day sessions of their various chemistry groups (organic, physical and inorganic, analytical, etc.) at the Hotel Roosevelt in Manhattan. Several papers listed on the program pertained to photochemistry, but only one referred specifically to the photographic process. This paper, entitled "Intensification of the Silver Halide Photographic Image by Means of Polymerization", by Gerald Oster, Polytechnic Institute of Brooklyn, I wanted to hear. The heavy snow on March 14 in New York delayed the lecture program, and so I was forced—so to speak—to sit through a few earlier scheduled papers before Dr. Oster made his appearance. I am glad this happened, because one of these papers embodied unexpected photographic implications. As I've said, one never knows in advance where progress in photorecording will originate.

I refer to a paper entitled, "Photochemical Reactions of Dyes in Glucose Glass" which again was the result of research carried out at the Brooklyn Polytechnic Institute, this time by Barret Broyde (who presented the paper), Jacques Joussot-Dubien and Gerald Oster.

The expression "glucose glass" may sound odd to you, but if you look up the definition of *glass* in a chemical dictionary you will find that it is a generic term for supercooled liquids of high viscosity. Ordinary soda glass, for example, is a high viscosity liquid at 575 C (viscosity of 11 x 10^{14} centipoise) which when supercooled to normal room temperature becomes a *solid* solution. Glucose glass is a glucose solution having a viscosity of the order of 10^{15} centipoise.

For reasons that are too complex to discuss here, certain dyes exhibit photochemical properties in glucose glass that are not evidenced in, say, water solutions of the dyes. The dye *Acid Fuschin*, for example, is fluorescent in glucose glass, but not in water. Other dyes, such as *Azure A*, are reduced to colorless forms when in glucose glass and exposed to *light*. Usually ultraviolet radiation is necessary to fade, i.e., to reduce, dyes to their colorless form, called the "leuco" of the dye. But *Azure A*, a bluish colored dye, is reduced to its leuco by exposure to red light when in glucose glass. No chemical reducing agent is required.

Now the remarkable thing is that *Azure A* in glucose glass, after fading under red light exposure, can be restored to a colorful form by a second exposure to radiation of a wavelength different from that of the red light. If the leuco of *Azure A*, is exposed to ultraviolet radiation a red form of the dye is produced. On the other hand, if the leuco is exposed to X-rays, a blue form of the dye is restored. Obviously, a photochemical dye reaction of this sort has the basic requirements for recording the presence and relative amounts of selected electromagnetic radiations. *Azure A* in glucose glass could be first given a heavy exposure to red light to make it colorless and individual flat pieces then wrapped in light-tight material. For X-ray dosimeters—one possible practical application of it—the light-tight packets could be worn by X-ray technicians, employees of nuclear reaction plants, industrial radiographers, etc., as a means for detecting the extent of personal exposure to harmful X-radiation. No development of the radiation detector would be needed.

For recording the ultraviolet the

flat pieces could be handled in the same way as photographic films, except the color change produced by the U.V. would give a direct image.

Intensification

Now to get back to the paper presented by Gerald Oster on the intensification of the silver halide image by means of a photochemically induced polymerization reaction. But first a few remarks about latent image formation and the over-all efficiency of the silver halide system.

For simplicity we can regard a photographic emulsion as merely a dispersion of silver bromide (AgBr) crystals in gelatin. When the smallest units of light energy, called "quanta", are absorbed by a AgBr crystal, one molecule of the crystal is reacted to produce an atom of silver metal and an atom of bromine gas for each quantum absorbed. If by chance the silver and bromine atoms should recombine to form AgBr again, then the light has accomplished nothing as far as image recording is concerned. This actually happens a few times out of ten, thus preventing the photochemical response of AgBr crystals from reaching perfect efficiency. An ideal photochemical system has a primary efficiency of 1.0, called quantum yield of 1.0, but AgBr crystals in gelatin have a quantum yield of something less than 1.0. But the over-all efficiency of the AgBr-gelatin system far exceeds 1.0 because the presence of only a few silver atoms on an exposed crystal are sufficient to cause selective reduction of all the millions of AgBr molecules within the crystal via catalytic action on the developer. Thus, from the few silver atoms produced by light exposure, millions of silver atoms are formed during development. In terms of light quanta absorbed, the number of silver atoms produced upon development can be as high as 1,000,000,000 times greater, an effective quantum yield of 10^9.

Dr. Oster has found a means for increasing the total quantum yield of the AgBr system by introducing a separate reaction system that is dependent upon what occurs when AgBr crystals are exposed to light. For some years it has been known that "defects" produced in crystals of sodium chloride and related compounds when they are exposed to light can cause certain substances of relatively low molecular weight to group their molecules together to form new substances of high molecular weight. This is called "photopolymerization". When silver bromide crystals are exposed to light it is thought that crystal defects play a

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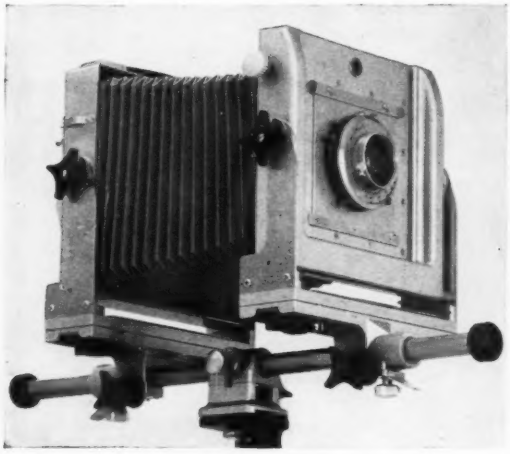

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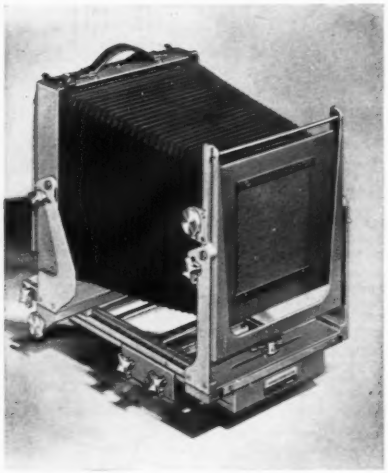

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part in the photochemical reaction. Oster reasoned that monomers (low molecular weight substances) could be made to form polymers (high molecular weight substances) if they were present when AgBr is exposed to light. However, he found that polymerization does not occur until the exposed AgBr is developed. Aminophenol developers at a pH of around 8.0 caused polymerization to take place at the same time that black silver was produced from the exposed AgBr. He used calcium acrylate monomer and determined by weighing how much of the monomer was converted to the polymer in the reaction. For each quantum of light absorbed by the AgBr crystals he found that 10^6 molecules of calcium acrylate polymerized during development. In a sense, then, the total effective quantum yield of the system is 10^{15} (10^9 from the silver bromide development and 10^6 from the polymerization reaction). The polymer formed in development greatly increased the optical density because of the light losses due to scattering phenomena: not to an increased yield of silver. But from a photorecording standpoint we are generally interested in how great the light-stopping power of an image can be made from a given amount of light energy, irrespective of the final product or means by which the light-stopping power is achieved. If Dr. Oster's secondary polymerization reaction can be developed to cause appreciable increases in "density" from given amounts of light exposure, films can be made faster, or of higher contrast, than now possible by means of AgBr alone. THE END

PMI's LLOYD VARDEN is sometimes apt to operate in pretty rarified air. We're not apologizing—fact is we're kind of proud of it. But we also consider it no more than humane to include the following little glossary, for the use of such readers as are swinging from trees and throwing coconuts at one another along with

The Editor

CENTIPOISE: .01 poise; a measure of viscosity. Calculated from the rate of flow when a substance is just fluid. pH: To Varden, the log of the reciprocal of the hydrogen ion concentration. To us, the measure of acidity or alkalinity of a solution. POLYMERIZATION: To change to a substance of higher molecular weight through rearrangement of molecules. SODA GLASS: Just plain glass.

...on high-speed photography

By taking motion pictures at speeds up to 3,200 frames a second, the Kodak High Speed Camera lets engineers study —in slow motion—events or actions that occur too fast for the eye to see.

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Design engineers can study and restudy machine operation, the actions of gases and liquids, movement of solid particles, stress, fatigue, and vibration.

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Want to learn more about high-speed movies and how they can help your company or clients? Send for the FREE booklet, "High Speed Motion Pictures at the Service of the Engineer." Or ask to borrow the Kodak movie on high-speed photography, "Magnifying Time."

HIGH-SPEED MOVIES SHOW:

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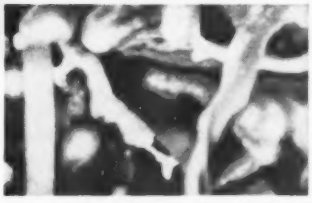
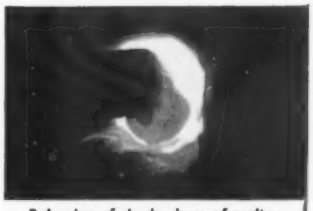


How machine-tool coolant removes heat.



Behavior of single drop of molten steel from welding electrode.

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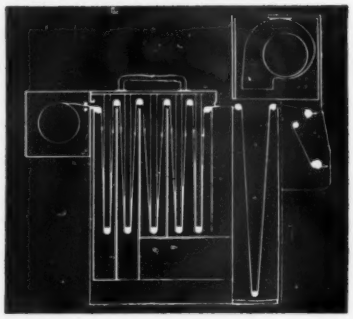

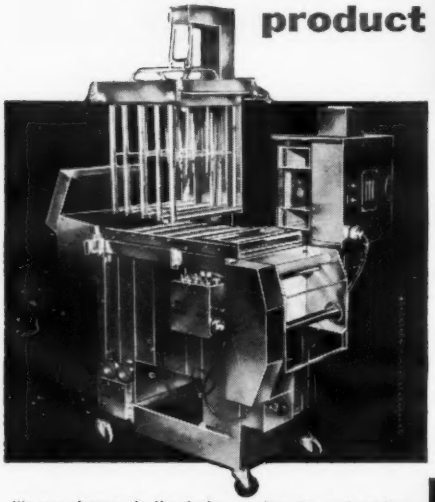

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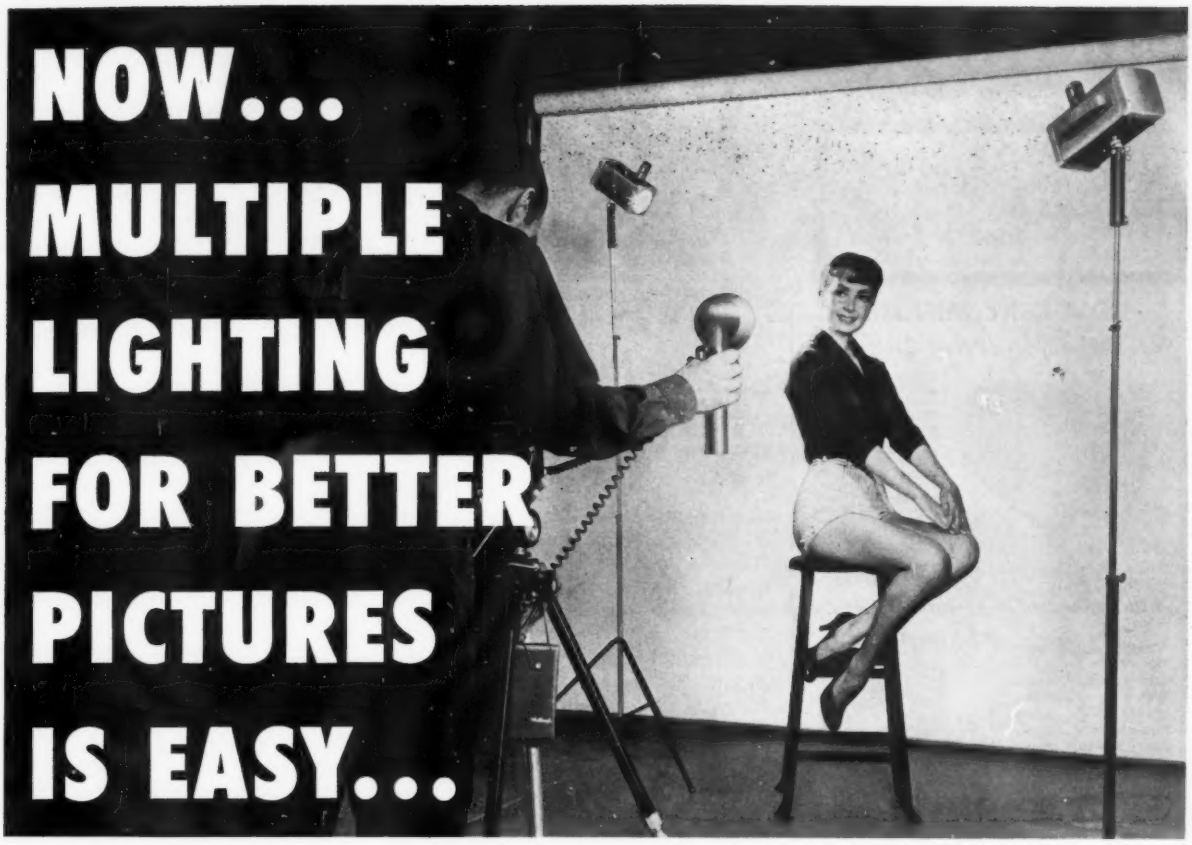

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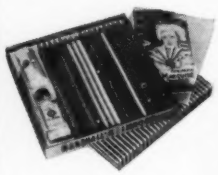

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by **Ernest E. Reshovsky**

PHOTO INSTRUMENTATION

Tracking 800 MPH subjects with a hand-held rapid sequence camera

E. L. Garrison, a photographer at North American Aviation, Los Angeles, specializes in high speed sequence photography, one of the most erudite forms of technical photography. He became interested in it when company engineers needed an exact analysis of certain phenomena, such as those in pilot seat ejection from speed sled runs and parachute behavior at high speeds.

"The introduction and development of rapid sequence photography has been a necessity during the last few years," Garrison says. "A number of engineering test programs have been conducted, which, because of extreme difficulty in recording the data, have demanded a type of photographic treatment not possible with either still equipment or with 16mm motion picture equipment. A sequence camera, because of its larger film size and longer focal length lens is capable of rendering sharp black-and-white enlargements of test subjects even when used as far away as 1000 ft."

For his work Garrison uses a Hulcher 70 Press rapid sequence camera, which shoots 70mm perforated film in 100-ft. rolls and produces 2¼ x 2¼ negatives. He hand holds the camera which is equipped with a 20-in. Bausch & Lomb f/5.5 telephoto Anastigmat.

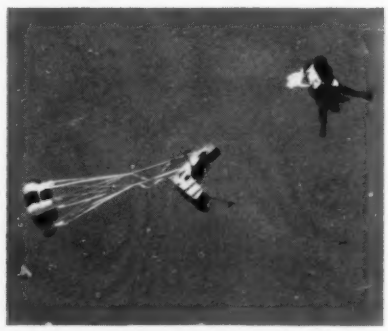
E. L. Garrison, North American Aviation photographer, demonstrates use of the flame orange finder on his Hulcher.

Express tracking

To enable him to track—with the hand held camera—subjects traveling at well past 800 mph, such as a high speed experimental sled, Garrison has equipped his camera with a viewfinder of his own design. "We found that panning a hand held cam-

THE 20-IN. LENS: DETAIL WITHOUT DISTORTION

Seat and dummy pilot blast off from test vehicle. Made with 20-in. Bausch & Lomb telephoto anastigmat.



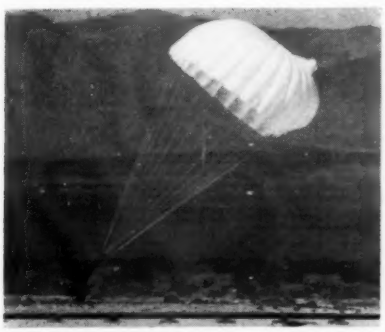
Dummy pilot and seat separate. Shot at 1/1500 sec., f/11, on Plus-X; rating hiked in development to 1000.

era to follow a fast moving subject is difficult. While following this accelerating vehicle it is extremely difficult to frame and hold the object accurately within the limits of a viewfinder. We therefore designed a special viewfinder using 'flame-orange' fluorescent plastic material. It is mounted as far as possible from the eye without interfering with the lens. Even while panning at a high rate with the eye focused on an object at infinity there is still a definite color impression of the limits of the angle of view, since the 'flame-orange' color is a definite contrast to either blue or overcast sky," Garrison explains.

Using Plus-X film which is boosted in development to nearly ten times its rated speed, excellent 16 x 20 enlargements are produced, which can be studied in full detail by the test engineers. Recently satisfactory tests were made with Super Anscochrome.

On a high speed sled run the requirement was for a side view over most of its 3000-ft. run. To record this properly, the camera had to stay about 750 ft. from the track; otherwise only a few frames would show the side view required, while the beginning of the film would show a front view and the end of the film a rear view of the sled.

Garrison finally found that the 20-in. telephoto lenses, which were mounted on the Hulcher 70 cameras were the answer to the distortion problem, allowing him to stay far enough back to photograph at only a few degrees deviation from right angle. Tracking an object at faster than 800 miles per hour with a hand held camera is quite a feat, but Mr. Garrison demonstrates that it can be done with proper equipment and technique and highly successfully at that. THE END



Parachute landing of pilot dummy. Extreme detail is required for engineering evaluation of pictures.

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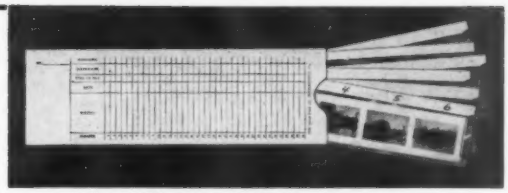

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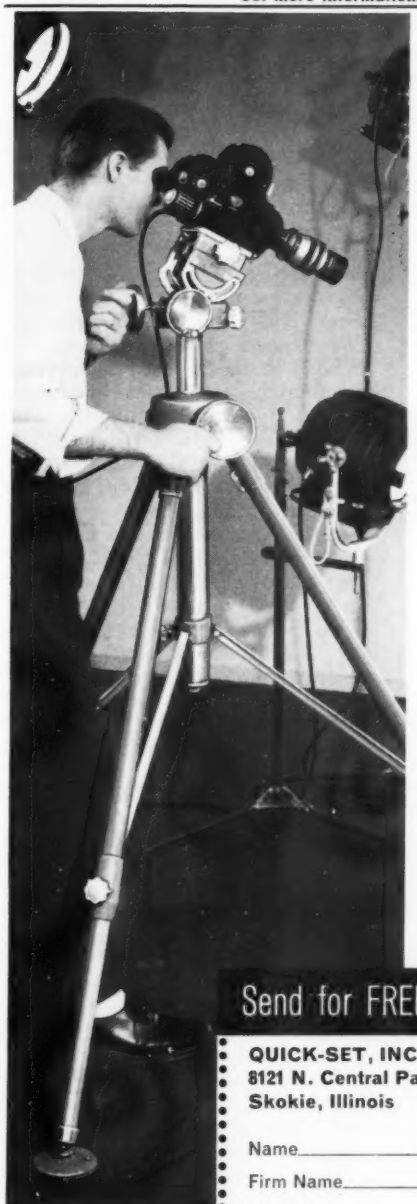

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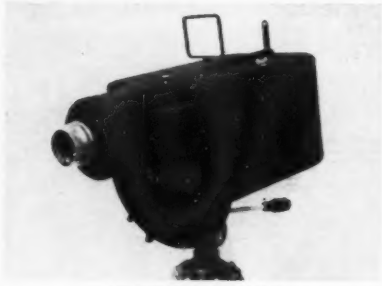

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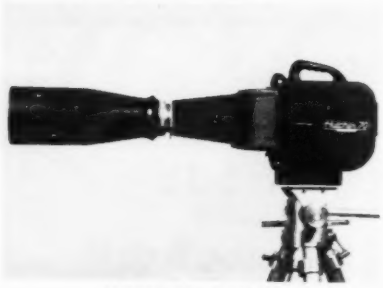

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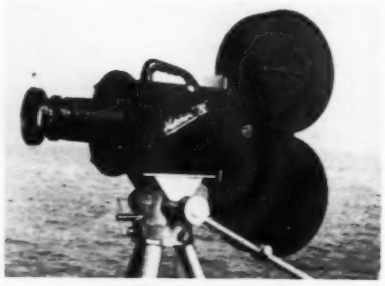

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by Edward R. Farber

ELECTRONIC FLASH

What every young man should know about new transistor units

Four American made "transistor flash" units were introduced at the recent photo dealers' show in Chicago. Ascorlight, Heiland, Hershey and Vanguard versions are all different from each other and from previously introduced, imported models.

The "Futuramic" by Heiland, the "Vanguard" by Romal and the Hershey are monopacks with batteries, power pack and reflector in one self-contained unit.

The "Futuramic" uses either regular photoflash or nickel-cadmium "D" cells in a tubular handle reminiscent of the Heiland flashguns. The compact lamp head contains a circular tube in an ingenious reflector which is said to provide a seventy degree beam, certainly a desirable feature. Some might think the unit a little heavy for small cameras. It can be used with AC.

The "Vanguard" features a sealed unit with a hermetically-sealed nickel-cadmium battery and built-in charger. Battery is rated for a minimum of 10,000 flashes. Weighs only 36 oz. Seems ideal for flash-on-camera with miniatures.

The Hershey units are similar in shape and size to their previous units, but have the transistor features. Can be used with AC and battery.

The American Speedlight Corporation Ascorlight A422 and A423 are handsomely styled and of great interest to professionals because of their many features: push button switching from full to one quarter power; trigger tube triggering; "D" cell or heavy duty nickel-cadmium batteries; interchangeable reflectors; wide, comfortable shoulder strap; and a choice of 100 or 200-watt-second models, weighing 7½ and 8½ lbs. (with nickel-cadmium batteries) respectively.

Transistors are usually associated with extreme reduction in size and weight of electronic equipment. Electronic flash units do improve in these respects when transistors are used to replace the vibrator in the power supply but not as dramatically as some other electronic equipment. Perhaps a little review of the flash units "innards" will explain why this is true.

Most portable speedlights store direct current in capacitors (condensers) at voltages ranging from 200 to 2500 volts. (*In general*, higher voltages require heavier equipment, give greater action-stopping for a given total amount of light.) Although high voltage current to charge the capacitors can be secured directly from high voltage batteries, this simple method is often costly. More frequently, the power comes from low voltage batteries, dry or wet. To change low voltage DC to high voltage DC is not simple. Transformers can change low voltage alternating current to high voltage alternating current. But they do not work with DC, so a vibrator has long been used to interrupt the DC from the battery in such a manner that the transformer is fooled into believing that it is fed with AC.

A vibrator—a mechanical device containing a vibrating reed with electrical contacts in a case an inch or more in diameter and two or more inches long—can be replaced by a couple of transistors, each no bigger than a cough drop. Because the transistor can change the DC of the battery into AC of a much higher frequency than that of the vibrator, the transformer can be smaller and lighter as well.

Easy Idling

Thus transistors can save some space and weight, but chief advantage comes from the low idling current drawn from the battery during the time the unit is turned "on" and is "idling" between flashes. This permits many hours more useful life from a set of batteries than with vibrator operation which requires far more power to operate.

For example, the Heiland "Futuramic" transistor model is said to give twice as many flashes under average use as the standard model, truly an impressive improvement.

As the watt-second rating of units goes up, this proportion of improvement decreases somewhat, since the larger units are comparatively more efficient than the smaller ones.

What to ask

Some pertinent questions might be asked about the reliability of transistor units. Transistors themselves should be above reproach, but they must be used under conditions specified by the manufacturer, particularly as to temperature. They are usually mounted on metal plates called "heat sinks" to conduct away the internal heat generated in their operation. In a marginal design, rapid flashing, plus fresh batteries, plus a hot summer day (which also increases capacitor leakage) could cause failure due to insufficient heat dissipation.

As transistors are not inexpensive, it would be well to inquire about replacement cost and the nature and length of the guarantee on parts and labor.

If the unit uses both AC and batteries, check for possible shock hazard by measuring the AC voltage between the case of the unit and a good ground when the unit is plugged in for AC operation. Try with the line plug reversed also.

How to check recycling

Be sure that the recycling time is not excessively long for your type of operation. Check the manufacturer's recycling time by flashing the unit and then taking a picture at the end of the stated time. Make another shot at the end of double the recycling time. There should be no visible difference in the density in the shadow areas.

All in all it would seem that transistors will offer definite advantages in the small compact unit, and for situations where long idling times are encountered. In general, however, electronic flash should be evaluated on the basis of meeting your specific requirements, whether it has transistors or no. THE END

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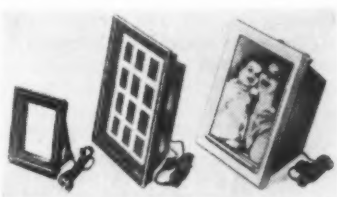
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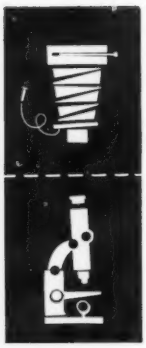
AN EDITORIAL

IN-PLANT OR FREE LANCE?

An industrial photographer's problems are not all photographic. Recently, while out of town on assignment for PMI, we spent some hours with a favorite in-plant photographer and friend. While his five children romped around and his wife busied herself making dinner in the kitchen of his suburban home, he expressed the dilemma. Although he worked for a huge corporation, he had gone as far as he could go positionwise. Furthermore, management was stymying his best efforts, ignoring his new ideas. They didn't, he said, realize he existed. And when there was a plum to shoot, a glamorous advertising or publicity shot, management often called in a free lancer. Why put up with it? Why not go free lance? What were the chances of a capable top in-plant man pushing out on his own in industrial and commercial photography? Why stagnate in company harness?

On the other side of the fence where the grass supposedly grows greener resides the free-lance photographer. We had been talking with him only a few days before around New York. His grass was green in-plant. His question: did we know of any staff jobs open? Who wants to eat hand-to-mouth day-by-day? Wouldn't it be nice to have someone else furnish the expensive equipment you need, to be able to check out after eight hours work and enjoy a regular salary which could purchase a home? Freedom? Sure every once in a while the free lancer gets a cream-puff job, but look at all the junk he must shoot, sometimes 24 hours a day, to pay the overhead on his own studio, his answering service, model fees, to buy equipment. Imagine being an in-plant man, relatively free of monetary worries, really concentrating solely on photography! Maybe introductions are in order.

The Editors



MACRO & MICRO PHOTOGRAPHY WITH YOUR 4 x 5

Do you really need complicated equipment for extremely close photographs or occasional shots through a microscope? Bernard Hoffman uses simple equipment for all his work. Here's how.

When a Speed Graphic, Linhof or similar bellows-extension camera is used for normal industrial and news assignments, it is actually operating at about half of its potential. There is another phase of photography which lies well within the capabilities of these cameras. This is a world which in most part, is invisible to the unaided eye.

The human eye is capable of focusing down to about five to ten inches. Any method which enables us to "get in" closer will show us things which we have never before been able to see. Magnification photography provides such a method.

Excellent high and low magnification photographs can be made with a 4 x 5 camera, so there is actually no reason why this field should continue to remain a "specialist" one. Macrophotography (for our purposes, low power magnification photography) and photomicrography (photography through a microscope) are exciting and rewarding branches of photography and there is no mystery about them. You look in your ground glass and when you see a good picture you shoot it—just like portraits, interiors and sports.

Aside from the functional value of such pictures—and it's an important one in industrial photography—there is ample room for an imaginative aesthetic approach to magnification photography. My photomicrographs recently won the highest Readex award for the Hercules Powder Co. in Chemical Weekly, when the Hercules advertisements outpulled the editorial reader interest. The series was done with a standard 4 x 5 camera and a minimum of expense and equipment.

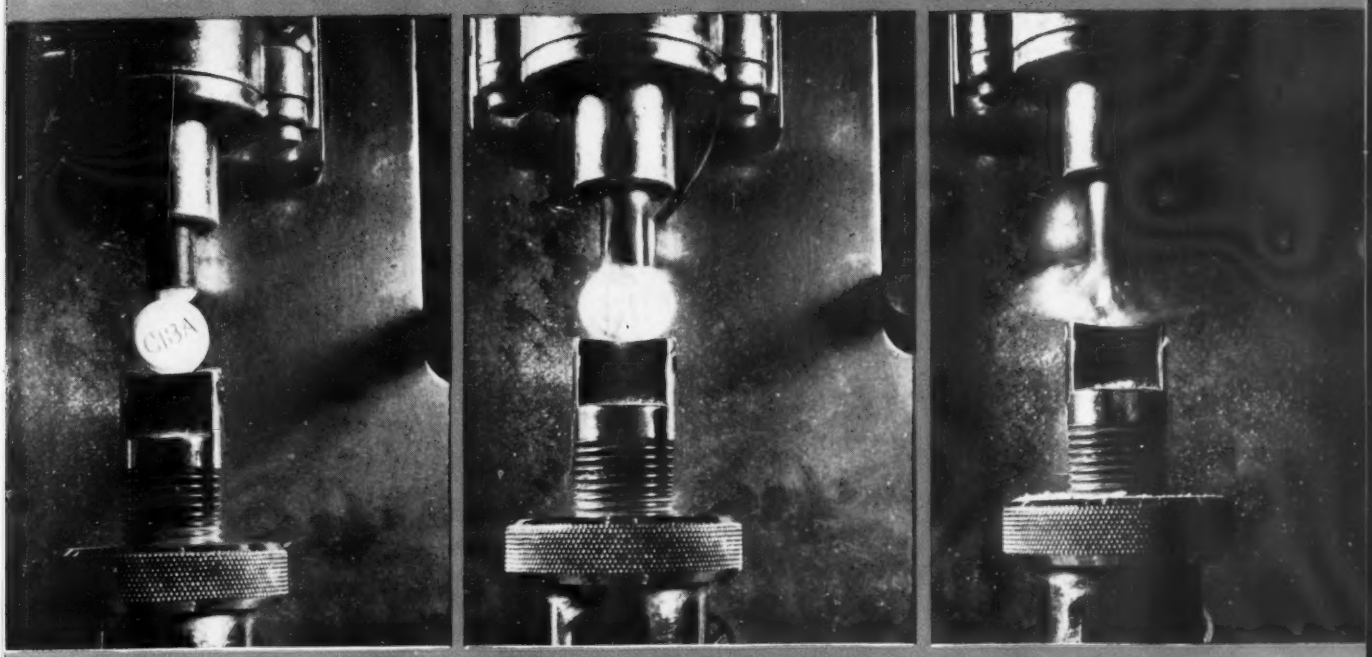
Macrophotography

Macrophotography is the low magnification end of magnification photography. If a 5¼-in. lens is used in a 4 x 5 Speed Graphic with full bellows extension we would obtain an image approximately the same size as the original subject. If a Linhof having a triple extension bellows is used at full extension, the image is about 75 per cent larger than the original subject. This difference is not great enough to cause any alarm or to feel that one camera is greatly superior for this type of work than the other. The image obtained with the Graphic single extension bellows can, for all practical purposes, be enlarged in printing, to compensate for this difference.

When I use my wide-angle lens (of about 3-in. focal length) with full bellows extension in a 4 x 5 Speed Graphic, I get an image about 50 per cent larger than the original subject. When used in a Linhof having a triple extension bellows, the same lens will produce an image about four times larger than the original subject.

Another lens in my collection is an f/3.5 50mm lens from a 35mm camera. Using a 4 x 5 Speed Graphic at full bellows extension this lens will produce an image of 5X magnification.

My shortest focal length lens is an f/3.5, 25mm Taylor Hobson Cooke which is made for 16mm

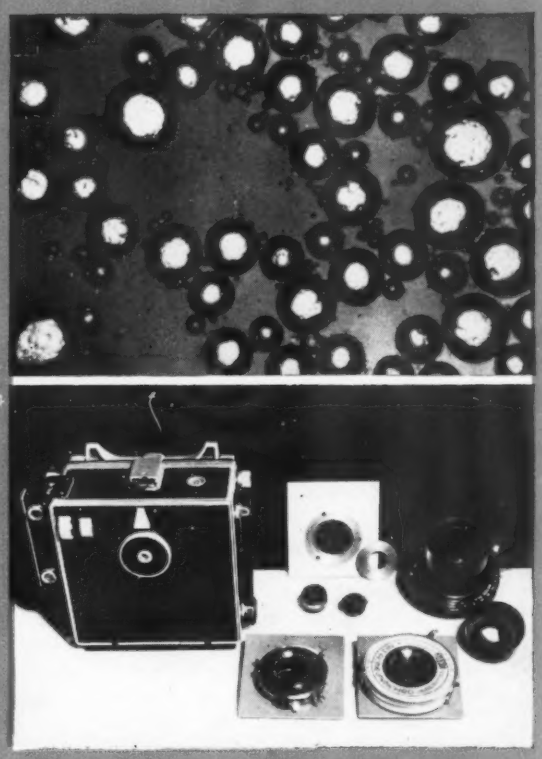


How much pressure will a pill take and still hold its shape? That's the photographic problem Hoffman faced for the CIBA Pharmaceutical. The machine itself was used to set off a mu ltiple electronic flash by means of a wire tripper circuit.

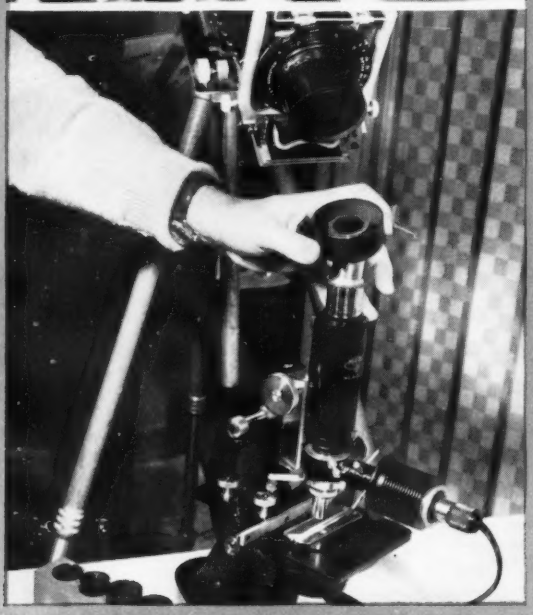
MACROPHOTOGRAPHY

It usually refers to photographs taken at a magnification less than 50X. You use a single lens generally right on your camera and work with a lens-to-film distance at least twice the focal length of the lens. Watch your lighting closely. Flat lighting is easiest to use and is excellent for record work. Multiple lighting, however, can produce more imaginative photographs. Work with your lights as if you were shooting a portrait, and accent the importatnt traits of your subject, better pictures result.

LENS *(focal length)*	BELLOWS EXTENSION	MAGNIFICATION
5¼-in.	single	25% reduction
	double	12% larger
	triple	75% larger
3-in.	single	50% larger
	double	185% larger
	triple	4X larger
2-in.	single	5X larger
	double	8X larger
	triple	12X larger
1-in.	single	8X larger
	double	12X larger
	triple	18X larger



Macrophotograph, above, shows texture study of ice cream with low-angle lights. Equipment is simple—camera, lenses, an adapter. They are explained in text.



PHOTOMICROGRAPHY

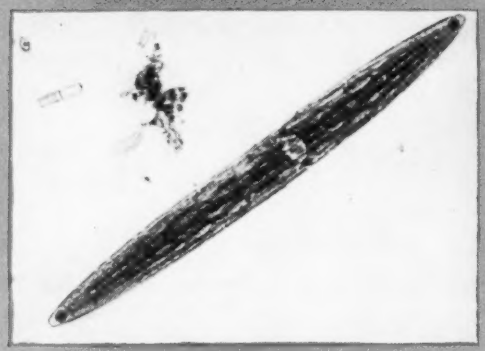
A standard microscope coupler *(above)* can be purchased with a shutter which should have speeds of at least 1 to 1/100 sec., plus "bulb." For best results, don't use camera lenses when making photomicrographs. The image must be formed by a good microscope (which acts as the camera lens). Magnification can be changed by varying the lens combinations used on the microscope itself.

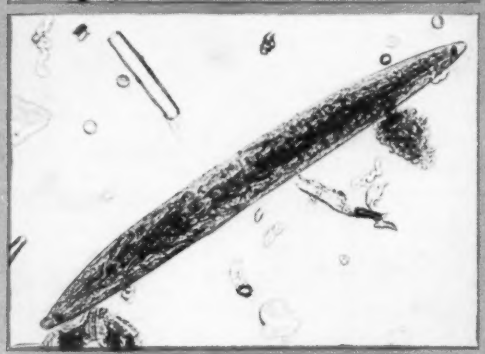
CREATIVE LIGHTING

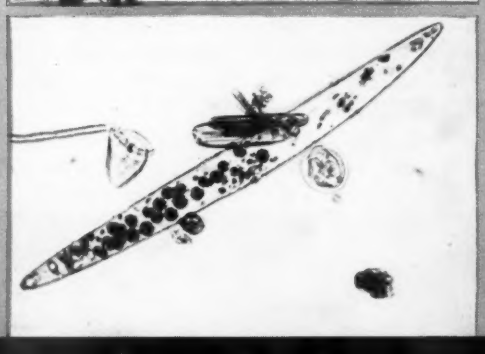
Lighting can make or break any picture, even a photomicrograph. By adjusting your lights, differences in form, depth, texture may be muted or accented. Moving a light as much as 1/16 in. will produce a tremendous change in picture results, so cultivate a light touch and make the most of fine adjustments in lighting angles. Don't forget to experiment with both reflected and transmitted lighting.

◀
Ice cream before it's had a chance to melt is real 1000X tour de force for photomicrography.

Photomicrograph series witnesses algae being destroyed by a new chemical compound. Shifting subject, extremely shallow depth of field produced real headaches for Hoffman. He survived.
▼







motion picture cameras and can be picked up for about $15 to $20. This lens produces an excellent magnification of 8X with a single extension bellows or about 18X with triple extension bellows on a 4 x 5 camera.

It is inefficient and practically impossible to focus by racking the bellows back and forth when working at full or near full bellows extension. The best and quickest way to focus and compose an image is to lock the bellows and focus by moving the whole camera. If the image is too large when brought into focus the bellows should be racked back an inch or so, locked and the camera moved as a complete unit to re-focus. If the image is too small the bellows should be extended, or a shorter lens should be used—unless it is decided that some additional enlargement in the darkroom will make up the difference.

A solidly-built tripod with a centerpost lift is very useful in magnification photography. Adjustments in height can be made rapidly with the centerpost and the whole tripod can be moved back and forth quickly for focusing.

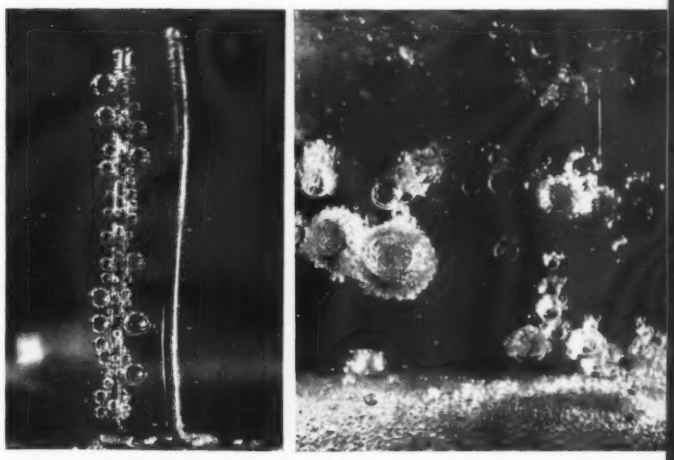
Lighting and exposure

Since magnification photography requires the camera lens to operate as close as ½ to 4 in. from the subject, lighting has to be watched carefully. I find that generally, the ring type of light which encircles the lens is too flat for imaginative photography—although it is an excellent light source for record work. I usually work with two or three sidelights, either small flashbulbs or electronic flash units. Their speed helps cut vibration effects.

My "smashlight" or highlight, is usually placed about 10 in. to one side of my subject to hit at about 10 or 12 degrees. Fill light is usually placed about 14 in. away and comes in at about 10 to 20 degrees, depending on how close my lens is to the subject. The low angle avoids having the lens cast a shadow over the subject. If I am working with a light subject I usually use Panatomic-X film. If my subject is a dark one, I prefer Royal Ortho sheet film.

Since my small lenses are not equipped with shutters I usually make an open-and-shut exposure by holding a dark slide in front of the lens until I am ready to shoot. It is important to have a completely vibration-free shutter, because any sort of vibration is greatly magnified in this type of work.

Naturally, I work as precisely as is humanly possible to get an optimum exposure. Since a single shot can at times involve a whole day's work, I can't afford to operate hit or miss. With extreme close-ups, bellows extension is an important factor. A 2-in. lens at f/11 and focused with a bellows draw of 10 in. has an effective aperture of f/55—a difference in illumination at the film plane of 25 times. Charts are available commercially to give you the effective aperture with bellows extension; and the following method also works. Divide the rated focal length of the lens into the lens-to-film distance (be sure both are in the same units, inches or millimeters or what have you). Multiply this number by the *indicated* f-stop. This result is the *effective* f-stop.



Left: Steel wool in acid with and without protective coating. *Right:* Silica floatation in water caused by chemical reaction. Shot made of subject in tiny test tube. Careful lighting avoided reflections on glass.

Working with small flashbulbs and medium sized electronic flash units, using fast film for dark subjects, varying my lamp to subject somewhat depending on my bellows extension—most of my macrophotographs over the past 17 years have been shot at f/22. Calculating exposures with guide numbers and bellows extension factors can get you started on the right track, but I've found experience to be a better guide.

Photomicrography

A microscope used in place of a camera lens provides magnification up to about 1,500 diameters. There are many ways to attach a Speed Graphic, a Linhof or their ilk to a microscope. The best method is to pick (*continued on page 63*)

HERE'S HOW I LIGHT IT

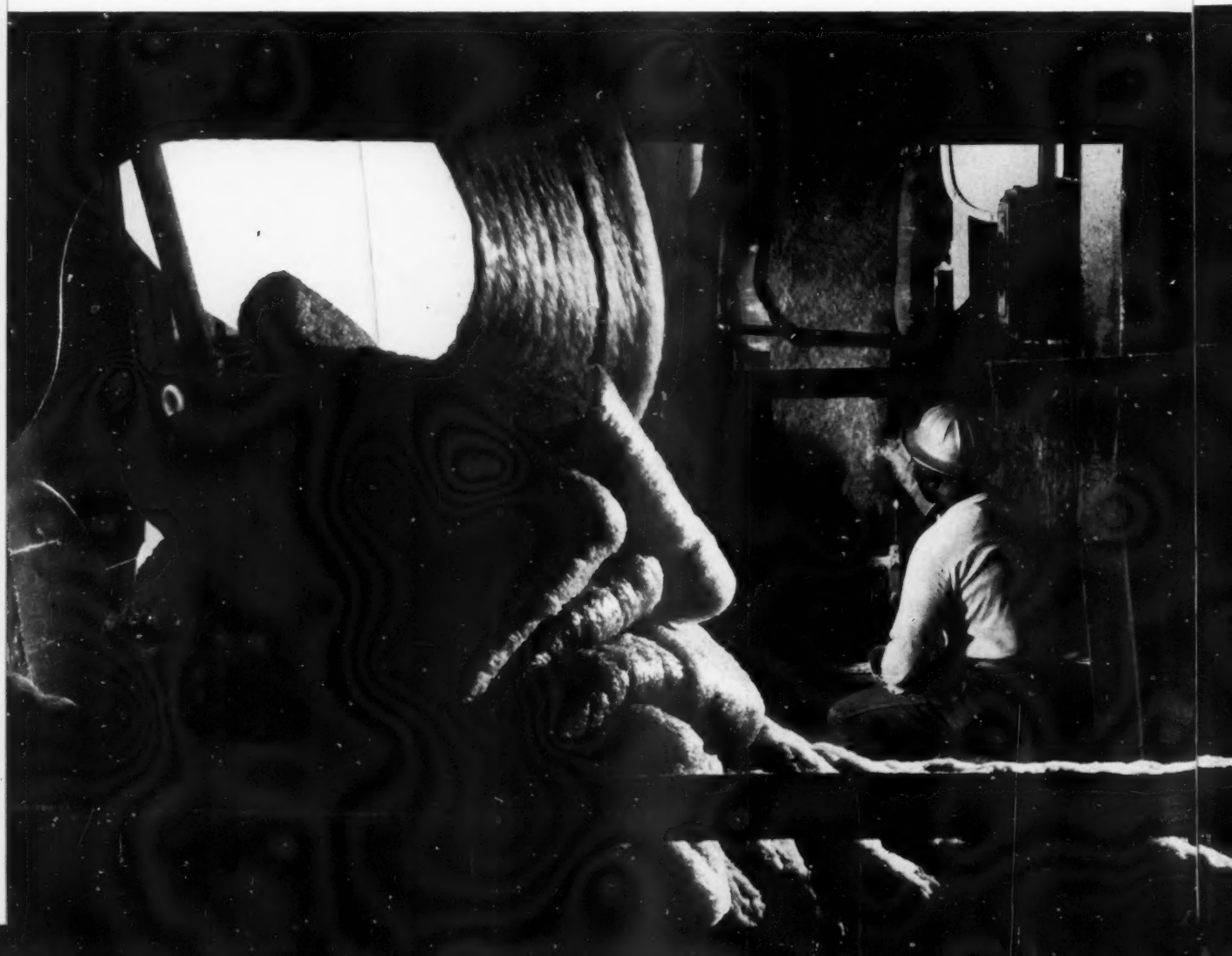
You can blast an entire area with flash or flood, but a little direction never hurt any lighting or photographer says Arnold Eagle.

The scene below was pretty dull in real life. A load of fluorescent overhead fixtures illuminated this butyl rubber processing machine making it look, if anything, even worse than it actually did. From this visual nightmare I had to produce an interesting dramatic shot. Lighting made the difference between the dull and dramatic.

In the chem lab at right, all I could see through my finder was a crazy maze of glass. In this case, I couldn't turn out all the lights and try for drama, since the very complex detail of the glass setup was essential to the shot. Still, careful lighting rescued the picture. The assignment was a success.

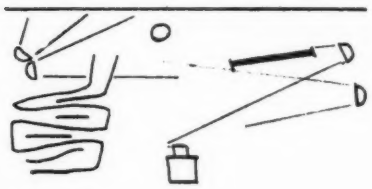
Frankly, I've never felt that blasting the whole area with light was the answer to any shot, even the daily functional—if the functional could be made more interesting without destroying the intent of the picture. Obviously, you can't make a low-key dramatic shot of a subject in which maximum detail is required.

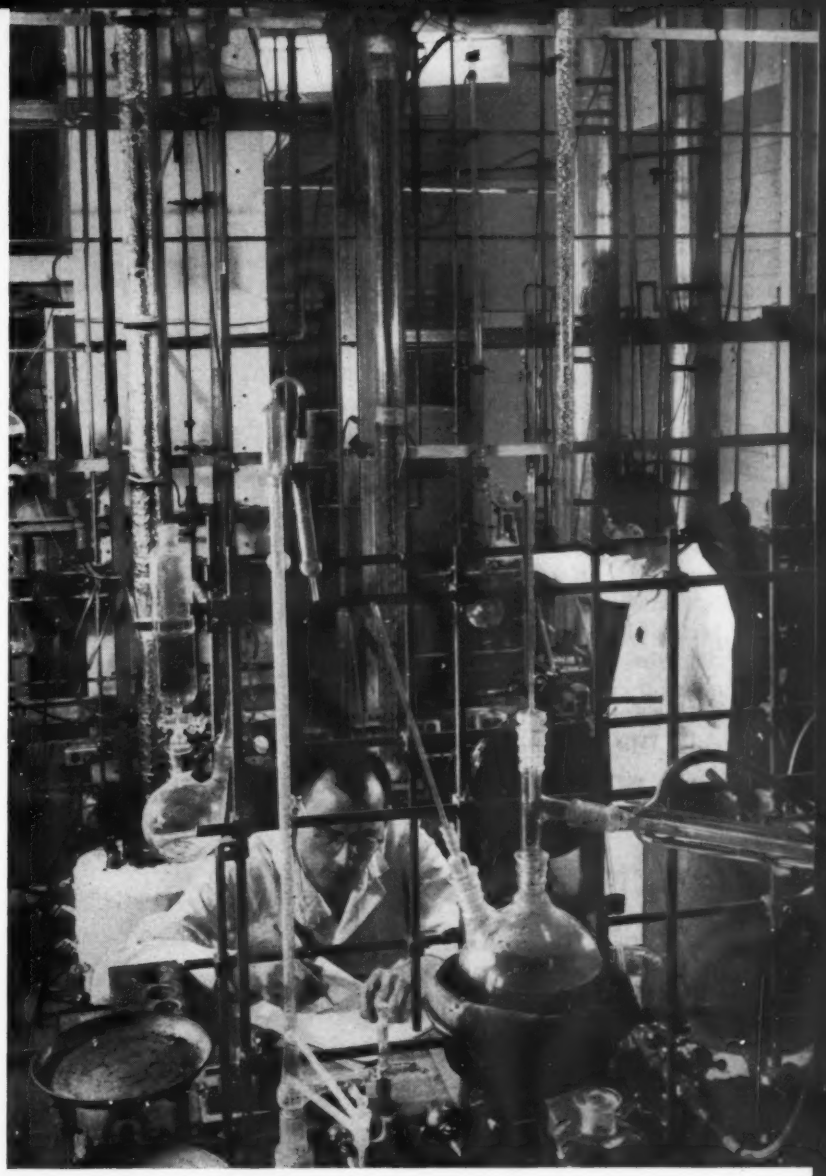
I've been using flash, electronic flash, floods and daylight over a period of 15 years. I don't think any one light source will do the trick for you all the time. I don't hold brief for any particular flash unit, film, camera. The good photographer has to be ready to discard even the best equipment if



ADDING DRAMA

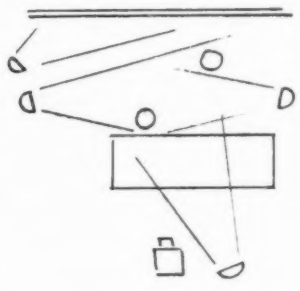
The Standard Oil Co. butyl rubber machine in Baton Rouge, La., is generally flatly lit by fluorescents. The scene looked dull through my Contax II 35mm wide-angle viewfinder. A dramatic lighting setup was substituted with two 100-watt-second flash units at left. One highlighted the background while another lit the machine operator. 200-watt-second units at right rim-lit machine and illuminated the rubber as it came from the machine.





ORDER FROM CONFUSION

By keeping all direct lighting away from the front distillation stand of a chemical research lab, I was able to get a much more dramatic and less confusing shot. I lit it with floods so I could watch my shadows and see where they were formed and where they fell. The two floods used at the left, the single flood at right and the front light were kept very high to prevent unwanted shadows from forming. Four by five view camera tilts were used to straighten out the distillation rack in the foreground. Since the subjects could be posed easily, I was able to use a long exposure and stop my lens down fully for full depth of field.



something better becomes available.

Generally, I keep my lighting equipment portable and light. Relatively speaking, of course. When I go on a story I take with me five electronic flash units, (including battery and lamp head). Then there are four floodlight stands, six stand lights, and about eight floods with alligator clamps. If I have to light a tremendous area, I'd rather switch back to flash, which can still give you more light than any other source. Two 200-watt-second and two 100-watt-second units—four flash heads in all—serve most purposes. I like to fire one connected directly to the camera. The others are generally used as wireless slave units. If I need more light, I can bounce some from a number of portable reflectors I habitually carry around. We'll talk about them later.

When my subject holds still, I see nothing wrong with light, portable floods on stands or clamp-ons. They can still be controlled most easily and they allow you to actually see what you're doing before you actually expose the film.

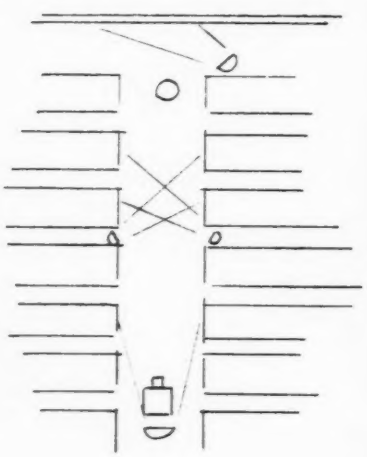
I've solved my problem of calculating multiple flash and electronic flash. First of all, I just don't believe in doubling up on light—having a second light source lighting up the same area as the first. Thus calculation stays simple. You use the guide number for the flashbulb or electronic unit figured on a simple source-to-subject distance. This, of course, doesn't work for bounce flash but I find that my industrial work most often calls for direct lighting anyhow.

In black-and-white I use Super Panchro-Press Type B and a somewhat faster film such as Royal-X Pan or Tri-X.

Despite the current tendency of many photographers to push the ratings of films higher than the ASA recommendations, I still do just the opposite when shooting flash, flood or daylight—overexpose and underdevelop cutting the rating by about 20

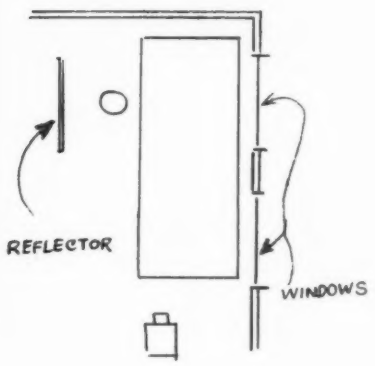
HANDLING A TIGHT PLACE

Lighting a narrow corridor such as this telephone switch room in Auburn, N. Y., sometimes takes a bit of sleight-of-hand. You need even light, yet no lights or wires can show in the picture. I took this shot a few years ago before I had electronic flash wireless slave units. Luckily I was able to place my flash reflectors in the recesses between switch panels and run my wires behind. Today I'd use the slave units.



DAYLIGHT? YES, SOMETIME

Although the tendency today in many forms of professional photography is strictly towards an existing light approach, it often won't do for industrial work. Here's where it did. Light streaming through the window illuminated the earth and molds in the petri dishes quite nicely. Why set up lights if you can use daylight? A reflector lightened the girl's face. Tilts on my 4 x 5 took care of keeping both foreground and background sharp.



per cent and decreasing development correspondingly. I shoot for a gamma of 6 or about 6.5. With Royal-X Pan, however, I figure my index at about 800 and develop in DK-50 as per the manufacture's recommendation.

Rather than stick to any set rule as to how to determine flood or daylight exposure, I generally take an overall reading with a reflecting light exposure meter. I also make a reading of the shadow area in which I want to hold detail. My final exposure will be a compromise between these. I find that I may not always be able to pull a straight print that will be perfect in all areas, but a little dodging or burning in will give me detail anywhere I need it, since I have it on my negative.

Color is a different problem. Instead of trying to choose between Ektachrome and Anscochrome, I shoot both on every assignment. I have yet to find a job in which the two films gave me the same results. Using both films—the Anscochrome is generally a little softer and warmer than the Ektachrome—I get what I want with one of them. If I have to push color film for maximum speed, I push Anscochrome as results seem better.

There's a lot of talk about color correction and color compensation. I don't keep a single color filter in my equipment bag. The color *is* way off when the light isn't properly balanced. But let's admit that sometimes it's way off even when the light is so-called properly balanced. I'd rather not take chances on ruining a good color shot by fooling with color filters while shooting. Instead, I wait until the transparency comes back from processing. Then I correct it by backing it up with the right shade of colored gelatin such as Bourges sheets. If you want the picture slightly warmer or slightly cooler, it's no trick at all to slip the Bourges sheet from the transparent sleeve and replace it with another shade. If you want to surprise yourself sometime, grab a bunch of the off-color rejects you haven't had the heart to dump in the

(continued on page 53)

PHOTO DEPARTMENT ANALYSIS NO. 5

VERNON GRAPHICS, INC.

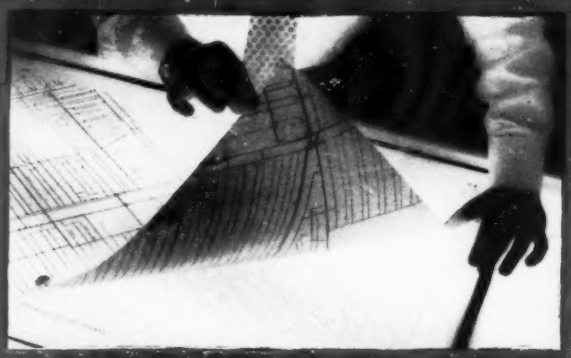
Up-to-the-minute graphic arts reproduction methods mean top quality at mininum cost for this fast-growing firm of map makers, who limit their work only to the fields that interest them. By Benjamin March

SKILLED HANDS, PHOTOGRAPHY,

1 Government Geodetic Survey points are plotted on detail plates to serve as accuracy checks in preparation of the photo-mosaic. By means of this painstaking process, error is limited to not over half of one per cent.

2 Planimetric detail, such as street outlines, is traced and scribed on polyester-base film. Adjustable double-scribing instruments are used to record proper street widths, etc. Changes may be made by opaquing.

5 Planimetric detail is gang-copied on polyester base litho film; later positive intermediates are contact printed on "Cronaflex" film. Polyester-base products are used because of their high dimensional stability.



6 Overlay system permits amalgamation of many types of data on one map, much flexibility in types of data featured. System itself is not new, but accuracy is increased, bulk decreased, by polyester-base materials.

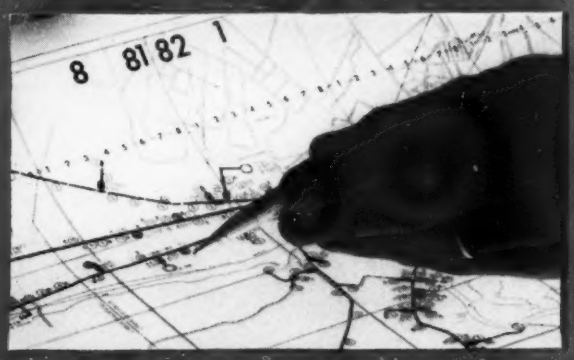
"Perhaps our greatest single achievement has been the intimate integration of photo processes and drafting techniques," says Ernest B. Wirth, Director of Photography for lusty, fast-growing Vernon Graphics, Inc., Mt. Vernon, N. Y.

Founded in 1947 to process records and make maps for public utilities, government agencies and others, Vernon Graphics now boasts 115 skilled technicians and 22,000 sq. ft. of working space in three locations: Mt. Vernon, N. Y., New Haven, Conn., and Norristown, Pa.

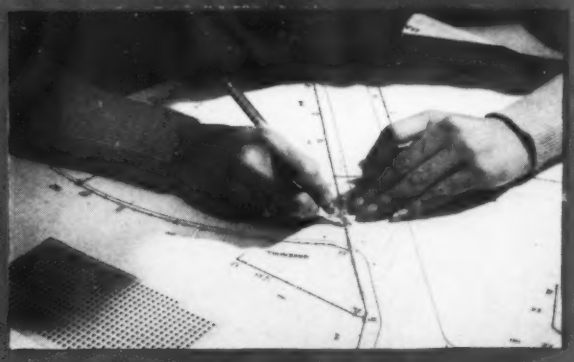
How are maps made, anyhow? Photography comes into all stages of the process. First the entire area to be mapped is photographed from the air. These aerial shots overlap and sidelap each other. Only the centers of the photographs are used to make the controlled aerial mosaic. Nine by nine-in. aerial photographs, generally on reels of film measuring as many as 225 ft. long, are contact printed on double-weight paper.

When enlargements are wanted, reels of film are carried through a special aerial film transport at the back of a Saltzman horizontal projector. With the Saltzman unit which is located in Mt. Vernon or the horizontal projector-enlarger in Norristown, aerial films can be enlarged as many as 20 diameters, as required. Map scale depends upon density of information that must be included.

YIELD PRECISION, EFFICIENCY

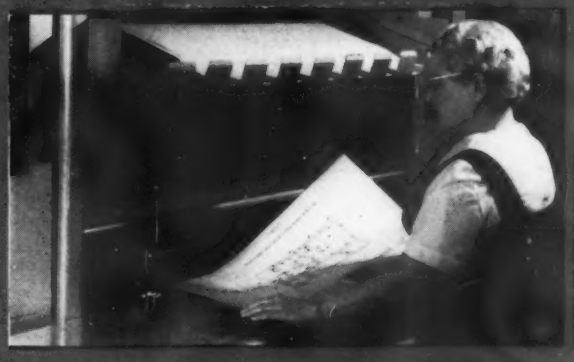


3 Tone-reversed symbol *(at pencil point)* is one of simple techniques of condensing data. In this case used to distinguish between electrical transformers of different capacities. Map contains photo and hand-drafted data.



4 "Stick-on" symbols, specially printed, help to speed up Vernon's map-making, in which hand drafting is held to a minimum. Sheets of the symbols are delivered with finished map, so customer can keep it up to date.

7 Photographic master is flooded with water and squeegeed on etching table, after chemical reduction to remove or clean up spots and specks. Waterproof light table tilts for draining, locks in level position for etching.



8 Outside blueprinter runs polyester film originals through machines for duplication. Duplication is quick and inexpensive. Maps may be updated on short notice, often by customer, with no tedious hand copying.

PHOTO DEPARTMENT ANALYSIS NO. 5 *(cont.)*

The next procedure is the plotting of U. S. Geodetic Survey control points. Each photo is then mosaicked on to this basic control. The controlled photo mosaic gives the actual planimetric detail of the area. It is divided into standard grid areas, which are then photographed on DuPont polyester base masking film, at the scale of the individual maps. From the masking film copy, the map details are single-and-double-scribed on a coated polyester film and photographed on "Cronar" Ortho A litho film, from which "Cronaflex" film contact copies are made.

Instead of putting all data on one work-master copy Vernon sometimes uses as many as four overlays to make up detail plates on the basic format. The sandwiched material is then contact printed. Or, backlighted, it may be photographed with a process camera, which allows the data to be enlarged or reduced. The camera in Mt. Vernon is a Wesel Process Camera with 8¾, 10¾, 12, 14, 19, 25, 30 and 36-in. Goerz lenses. Reduction up to 20 times and enlargements up to 8 times are possible on this unit. On the Wesel Process Camera in Norristown, Pa., a newer unit, a wider range of enlargements and reductions is possible.

Much of the information normally inked as sym-

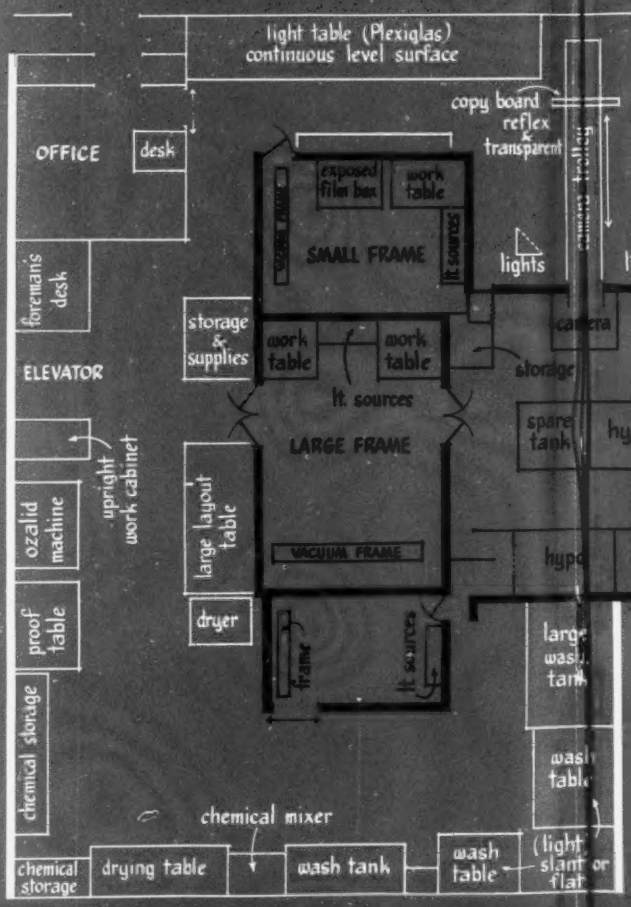
TWO PLANTS SPEED VERNON'S MAPPING, REPRO

MOUNT VERNON, N.Y.

Cornerstone of the Vernon system of fast, accurate mapping is intelligent mingling of photography and draftsmanship. Vernon Graphics spokesman says: "One without the other just doesn't make sense in today's quality, speed and dollar-conscious economy. Everybody's in a hurry and everyone keeps a weather eye out for costs. Photography helps rush things through and does so on a budget without neglecting quality."

Vernon Graphics' Reproduction Equipment

1 Saltzman Horizontal Projector **2** Special process cameras **1** Beattie Verifile 70mm Camera **2** Lacey Lucy Visualizers **1** Durst Laborator 3S Enlarger **6** Arc lamps—3 High Intensity Grafarcs **3** Macbeth Double Decks **5** Vacuum frames—from 30 x 40 to 54 x 80 **1** Paragon Revolute Dryer **1** 42″ Ozalid Machine **2** Lithotype whirlers **10** Process lenses—8″ to 36″ **1** Durst Micromat Componan 35mm for microfilming.



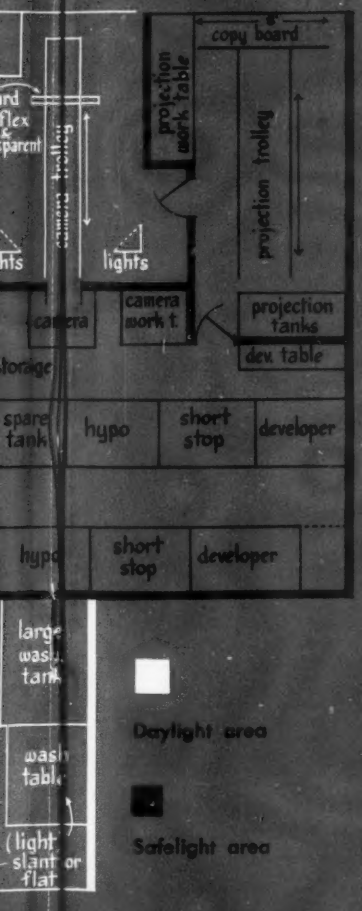
bols on work prints of maps, Vernon has press-printed on specially prepared pressure-sensitive sheeting. Without this "stick-up" material the symbol would have to be drawn by hand and its type inked in alongside—at an increased cost in time, money and map space.

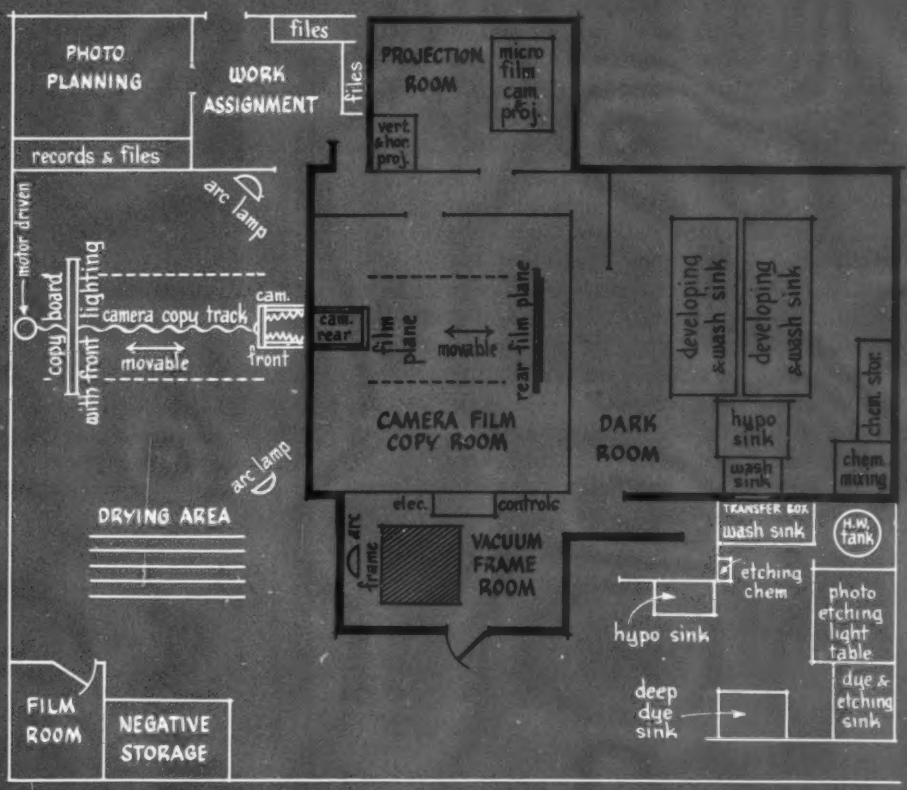
Clients send to Vernon Graphic prints of engineering drawings with wanted changes indicated, or a mock-up made from bits and parts of many drawings pasted together.

A "Cronaflex" film copy of the drawing is then placed in one of five vacuum frame contact printers and Transaloid paper negatives produced. In the Mt. Vernon plant, negatives are arranged on a 6-ft. x 22-ft. x 40-in. light table made by Vernon from ¼-in. Plexiglas sheeting. The corrected Transaloid negative is then contact printed on "Cronaflex" film. The positive together with the corrected drawing from the client go to the Vernon drafting department for inking-in of changes. The corrected "Cronaflex" positive then goes to the client for making of work prints. Or Vernon Graphics makes these prints for its customers on the 42-in. Ozalid Reproduction Machine in the Mt. Vernon plant.

Photography also enters the scene at Vernon Graphics via two microfilming units, a Beattie Verifile 70mm camera and a Durst Micromat Componan, used for record work. THE END

PRO SERVICE





NORRISTOWN, PA.

Half the Vernon process consists of standard drafting room procedures, the other half of standard photographic darkroom procedures; ingenuity appears in the method of combining the two to hold handwork to a minimum, keeping possibility of human error to a minimum as well. Microfilming operation is only one at Norristown that is not available at Mount Vernon. Drafting rooms are not shown on accompanying diagrams, as they are completely standard.

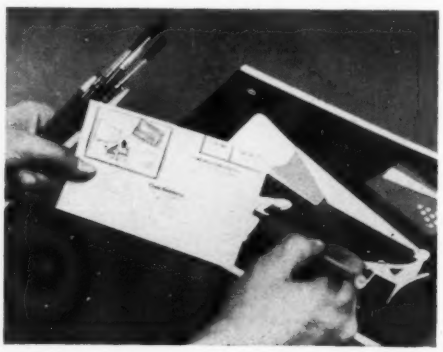
UPGRADE AV SLIDE QUALITY

by Peter A. Carey, Photo Chief, Eclipse-Pioneer Division, Bendix Aviation Corp.

Take it for granted that the industrial photographer is a master of the photo techniques and mechanics of visual aids. That, however, is but a third of the story of an effective slide presentation. Two basics remain—good organization of the material and competent handling of the artwork involved. The burden of all three is likely to rest on the photo department.

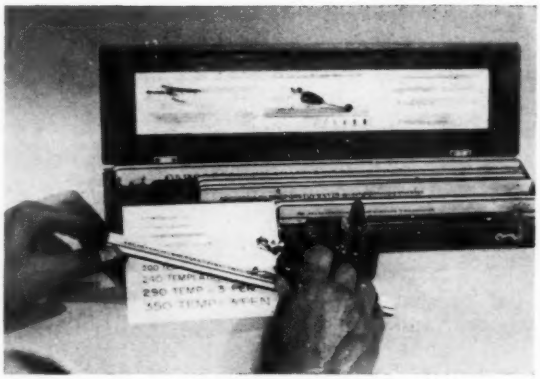
Here at Bendix inexpensive art aids help us avoid amateurish lettering and haphazard charts and graphs in our slides (*see pictures*). They contribute mightily to a good presentation, and anyone with half an eye can use them. I'll go into them later.

We feel that the professional photographer working in a plant has a responsibility for furnishing good advice, as well as good pictures. We have a system, in fact, to give our in-plant "clients" information and planning materials when they settle on



Story board, designed by photo department, keys efficient AV slide program at Bendix.

ART FOR SLIDES

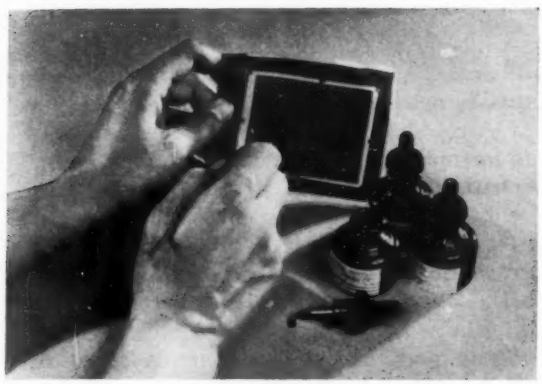


LeRoy Lettering Set, a draftsman's tool, requires minimal skill, turn out professional-looking lettering. A series of alphabet templates and a small pantagraph fitted with pen points of varying sizes comprise the outfit.

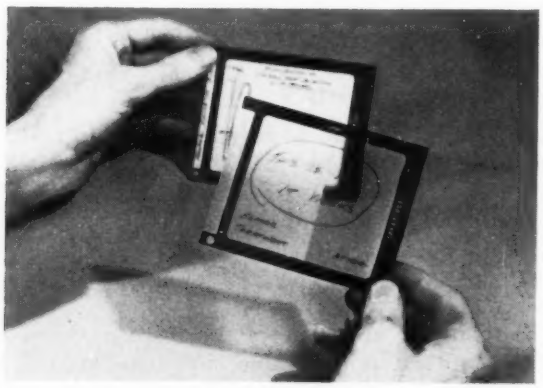
Obvious helps—colored paper, colored tape, scissors, rubber cement, razors, etc. combine with Artype letters supplied on adhesive-backed transparent sheets for neat colorful bar and pie graphs done quickly but well.

Fototype affords automatically spaced black lettering. Pasteboard letters taken from pads *(background)* are put face down in stick. Cellophane tape connects assembled line of type, which is drawn from stick, reversed.

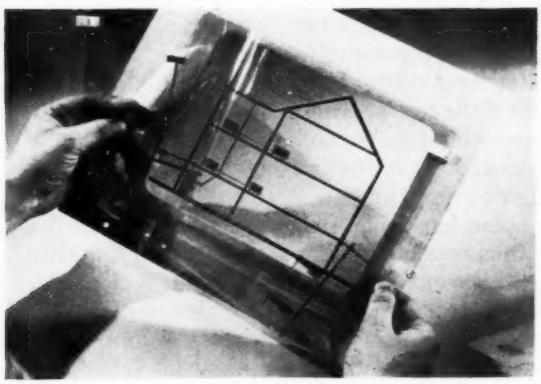
IN EASY DOSES



Water colors or acetate inks lend color to high-contrast negative copies of line drawings. Steady hand is not required because opaque area around lines obscures spill. Even 35mm negative slides may be converted to color.



Spray-Vue makes quickie slides. Product is of translucent plastic thin enough to be slipped in typewriter, has matte surface with "tooth" enough for pencil drawing. Sprayed-on coating makes slide transparent for showing.



Transparent diazo sheets, which reproduce colored lines from black on white line copy, come in handy for overhead projectors. Overlays held in register with tape show complicated diagrams with step-by-step simplicity.

slides as the answer to their visual aid need. The clients are usually grateful for the system. It certainly results in better slide presentations and it saves us time by reducing false starts and revisions.

Client relations

First we "think out" the assignment in terms of an organized presentation. We consider the introduction. We know that the first slides the viewers see must pack an attention-getting wallop—to spark an audience to want to see and hear more. Then comes the main body of the presentation. It should contain as many slides as possible for adequate coverage of the subject in the time alloted. Our final concern is the conclusion. Here all factors of the main body must be made to tie up with logical finality. Elementary—but often overlooked.

When an engineer or executive in our company requires a slide presentation, we endeavor to share our own experiences with him during the preparation of his project. One result is that he begins to think visually about his subject matter. Another result is that we begin to think of the presentation in terms of his personality and approach to the work.

An important effect of these work sessions is that the "client" learns that *we* want to help him turn out a presentation of well-prepared slides.

Although we frequently have to work against the clock to prepare a series of slides we consider this planning as important as the slide-making itself. Long experience with mistakes has proven that every minute spent conferring before slides are made is worthwhile.

The mechanics we employ in setting down on paper the fruits of conversations with a "client" are quite simple. We give him story board cards. He receives one card for each slide he thinks he'll require to make up the presentation. Each card carries space for him to jot down what he wants visually in the slide, and space for a brief summary of his accompanying text. Cards also carry the job number of the entire project, and a space to number the individuals slide for its proper sequence in the presentation.

Story board cards have a triple use in slide projects at our company: they help in arranging the proper continuity of a talk; they give us a good idea of what is wanted in the presentation; the "client" uses them as reference notes at the time of the presentation. They are key to our slide program.

As is the case with many items of photographic paraphenalia in our department, our story board cards are homemade. The original was drafted to our specification on white paper. We copied it on high contrast film and had our reproduction department run off a supply with an offset duplicator on card stock. Accommodating the "client", how-

HOW WE USE AV SLIDE MATERIALS AT BENDIX AVIATION CORPORATION

Selling aviation systems

Our firm is in the systems business. Time was when aviation companies supplied a gauge here and a control there. Now components are bid upon, designed, built and sold as an entire operating system. The increased complexity of aviation makes this integration necessary, with its efficiencies of specialization and weight and space savings. It all affects our work. An aircraft system is too heavy to carry and too involved to describe—much less sell—without visual aids. We supply them.

Training programs

In our business you don't turn out your product, set it on the counter and forget it. Bendix follows through with a continuing "school" for our own technicians, for customers and for ultimate users in the operation and maintenance of our products. Again, many matters can be explained only visually, and visual communication devices are the photo department's job. In fact we were recently called upon to help set a Division-wide standard for audio-visual equipment and supplies.

Better AIM

Eclipse-Pioneer encourages a voluntary program for supervisors, foremen and other members of "middle management" in the techniques of their job, called Achievement in Management, or AIM. Often the nucleus of the sessions of this program is a slide-illustrated talk by one of its members. Ideas and projectionists come from members, the slides from the photographic department.

ever, is merely a beginning for us. From his story board cards we try to figure out how many slides he *actually* needs to best tell his story. We know that a single slide should contain a minimum of words for maximum audience comprehension.

We have found also that each slide, regardless of size, should contain a single thought. When it comes to depicting a graph that shows flow, growth or size, we use the slide only to portray a trend. We leave the detailed mathematical analysis of the trend to the accompanying speaker's text. Thus we may recommend that the "client" increase the number of slides, simplify what they contain or drop slides that introduce ideas better said vocally.

To make the individual slide as clear, concise and graphic as possible, we are forced to pay a good deal of attention to such production factors as letter size, thickness of line, use of mass rather than fine detail, and proper employment of color.

Easy-to-use art materials

And here is where some easy-to-use artists' and other materials come into play. Items such as lettering sets, draftsmen's pens, diazo materials have become standbys with us. We've discovered, in fact, that we don't have to be accomplished artists or draftsmen to use this material for achieving impressive graphic presentation.

The following are some of the more common items in our art supply stable, and some typical uses we have made of each:

LeRoy lettering sets

Commonly thought of as a draftsman's tool, these sets, with a little practice, can become extremely useful. LeRoy units contain six assorted pen points, some holders, a series of templates and full instructions for their use in creating professional-type lettering. Units are packed neatly in wooden cases, but component parts can be purchased separately, if desired. Most art or drafting supply stores carry the LeRoy product.

In operation, a pen point is selected for the desired thickness of line. An accompanying template is then chosen. The template is a flat rectangular device resembling a ruler, but with scored stencil grooves. It serves as a guide to exact reproduction of lines and letters drawn with the pen. Templates, like pen points, come in various sizes depending on the width of the template's tracing grooves.

LeRoy items come in handy for rendering the various parts of a graph *(continued on page 54)*

by Lloyd E. Varden

ASA EXPOSURE INDEX: DANGEROUSLY SAFE

Overly cautious safety factors for determining Exposure Index backfire with new, steep toe films . . . Varden points out that ASA method underrates all black-and-white films. By how much? It depends on the film.

Of the seventy-odd years during which phototechnicians in the major countries of the world have battled to reach agreement on a method for expressing photographic film speed that would be acceptable to manufacturers and consumers alike, only the last fifteen have been fairly peaceful. But even in this period of relative calm certain elements of discontentment remained.

First of all, *universal* agreement on a film speed criterion has not existed ever. The English-speaking people throughout the world accepted (more or less) the method adopted by the American Standards Association, but on the European Continent the procedures specified in German Industrial Standards have been preferred.

Second, the ASA method has not been held in high repute by some manufacturers, and hundreds of working photographers have certainly not followed its teachings in practice.

Revolution in the making

We now find a peculiar situation existing. Manufacturers who staunchly supported the ASA method for determining film speed and exposure index are now advising photographers to cast the ASA values to the winds. Better results, they rightly say, are obtained when considerably higher exposure indexes are used than those derived by the ASA method. Experienced photographers, who have been doing this very thing right along, are chuckling up their sleeves. But students of the grand old art of photography who aspire to attain its pinnacles of perfection are—to put it mildly—a bit confused by it all.

Masters of industrial strategy see a revolution in the making. The entire structure of film speed standardization is tumbling, and tumbling rapidly. The foundations have already been seriously weakened, and it looks as though a new battle group (ASA Committee) will have to be formed soon to keep the peace. And it is likely that a complete reconstruction job will be necessary to put the ruins back in order.

What's behind the upheaval?

Considering the many years of effort devoted to formulating the "American Standard Method for Determining Photographic Speed and Exposure Index" (now ASA Standard PH2.5-1954) involving as it did numerous representatives from film and equipment manufacturers, and from various consumer organizations, one would think that an almost infallible procedure would have resulted. On the other hand, the mere fact that the method finally adopted was so long in the coming shows that the problem is not a simple one. Now wherein lies the fundamental reason to explain the present upheaval? Does the criterion upon which ASA film speed measurement is based rest on faulty grounds? Is the safety factor incorporated in de-

termining *Exposure Index* excessive? Are the characteristics of newer black-and-white films so different from before that they fail to comply with the sensitometric criterion of speed as defined in the standard?

Before we can discuss these questions, or raise any further ones, a brief review of certain features of ASA Standard PH2.5-1954 is in order. It is generally known that the philosophy behind the standard follows the concept that film exposure should be such that upon recommended development of the negative material a print having acceptable tone reproduction characteristics can be obtained from it. To correlate practical camera exposures and sensitometric data a large number of exposures were made to a wide range of subjects and the best possible prints were made from the negatives. The prints were then rated by many observers according to acceptability. It was found that excellent prints, as judged by the observers, were obtained whenever the camera exposures did not fall below a certain level. It was shown that this level of exposure (assuming a subject luminance range of 1 to 32 at the film plane) could be determined sensitometrically if the film types were restricted to those normally used for black-and-white continuous tone photography. Thus, the speeds of these films could be determined in the laboratory without having to make a wide range of camera exposures each time. The sensitometric criterion is defined as the exposure value corresponding to a point on the D-Log_{10}E curve where the gradient, i.e., slope, is equal to 3/10 of the average gradient over a log exposure range of 1.5. (A log exposure range of 1.5 corresponds to a luminance range of 1 to 32.) Techniques for exposing the sensitometric strips, processing them, measuring their densities, etc., are also specified in the standard.

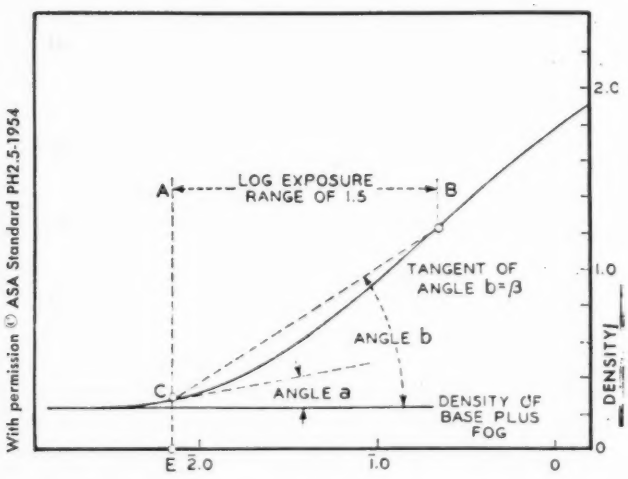
Film speed is computed by use of the formula,

$$\text{Speed} = \frac{1}{E}$$

where E is the above defined exposure value expressed in meter-candle-seconds. The written speed figure, however, is given an "o" prefix to distinguish the ASA Speed from other speed designations. Suppose a given film requires an exposure of 0.01 meter-candle-seconds to reach the point on its D-Log_{10}E curve where the gradient is 3/10 of the average gradient from this point to another point on the curve corresponding to an exposure of 0.32 meter-candle-seconds. The speed of the film would be 1/.01, or 100, written 0100.

The speed values are not recommended for use with exposure meters, etc. Rather, *Exposure Index* is defined for actual photographic practice as ¼ of the speed value. In the above example the Exposure Index obviously would be 25.

So we see that the ASA sensitometric criterion for specifying film *speed* is based on a minimum gradient so chosen that from this point on density increases at a sufficient rate to produce tone separation in a print. The *Exposure Index* is completely dependent upon the speed value, but numerically is only one-quarter of it.



Sensitometric criterion for ASA film speed is exposure value E (in meter-candle-seconds) determined from point C on D-log_{10}E curve where the slope (tangent of angle a) is 0.3 times the tangent of angle b, called beta. Beta (represents the average slope over entire log exposure range of 1.5 or relative exposure range of 1-32. Speed is 1/E, and exposure index is one fourth this value.

How valid is the criterion?

We can now return to the questions raised earlier, one of which pertained to the validity of the criterion upon which the ASA film speed method rests. The idea of using a minimum gradient on the sensitometric curve as a criterion for determining film speed is not as new as most photographers think. Dr. R. Luther in Germany in 1923 made suggestions along this line, but later he considered a specific gradient unworkable because its value depended upon subject contrast and contrast of the printing material. At the 1928 International Congress of Photography held in London, the late Loyd A. Jones and M. E. Russell of Kodak presented a paper entitled "The Expression of Plate Speed in Terms of Minimum Useful Gradient" where in they made a tentative proposal of a gradient of 0.20 for determining speed. At the conclusion of their paper Dr. Luther

PMI quizzed readers; majority regularly use exposure index substantially higher than recommended. Here are ratings many agreed upon; both columns are for daylight illumination.

FILM	ASA Daylight	PMI Readers' E.I.
ADOX		
KB RB 14	16	32
KB RB 17	32	64
KB RB 21	80	160
AGFA		
Isopan FF	16	32
F	40	80
SS	80	160
Ultra	250	500
ANSCO		
All-Weather Pan	64	125
Supan Hypan	200	500
DuPont		
High Speed Pan	160	300
Superior Press	200	400–500
GEVEART		
Microgran	32	64
Gevapan 30	64	125
Gevapan 33	125	250
Gevapan 36	250	500
ILFORD		
Pan F	25	50
FP3	64	125
HP3	200	400
HPS	400	800
KODAK		
Panatomic-X	25	50–75
Verichrome Pan	80	160–240
Plus-X	80	160–240
Tri-X	200	400–500
Portrait Pan	50	100
Super Speed Ortho	50	100
Super-XX	100	200
Super Pancro-Press, Type B	125	250
Royal Pan	200	400–500
Royal-X Pan	650	1600
PERUTZ		
Pergrano	16	32
Perpantic 17	40	80
Peromnia 21	100	200
Peromnia 25	250	500

took part in the discussion, stating that in his opinion a definite gradient could not be specified unless a "normal object", e.g., one having a luminance range of 1 to 32, and a "normal" positive material were defined. Jones in 1939 and Jones and Nelson in 1940 published further work on the subject which eventually led to the present ASA sensitometric criterion based on psychophysical data. The actual gradient on the sensitometric curve to which this criterion corresponds is of the order of 0.15 for black-and-white roll films, film packs and miniature camera films since the standard specifies a minimum *average* gradient of 0.50. The actual gradient in the case of sheet films and plates ranges from 0.18 to 0.24 because the average gradient specified for such materials is 0.60 minimum to 0.80 maximum.

Now there obviously is nothing fundamentally unsound about the use of a limiting gradient as a criterion for determining the speed of a film. Such a criterion may embody unnecessary complications of measurement, but it will assure that negatives made on the film will have printable detail in their lowest shadow areas. But reference here is to a particular film and not to many films having different sensitometric characteristics. Yet any standard method for expressing film speed must be applicable to a wide range of film materials. The ASA film speed committee was faced with the problem of defining a specific criterion that was generally applicable when determined in a prescribed manner. In tying a criterion in with an average gradient over a definite exposure range it must be assumed that all films for which the criterion is to be used have the same general sensitometric characteristics. At the time the ASA method was prepared, this assumption was reasonably valid, but during the past few years high-speed films have been introduced which do not have the "classical" sensitometric characteristics. They have much steeper gradients in the low exposure range and flatter gradients in the high exposure range in comparison with previously available materials.

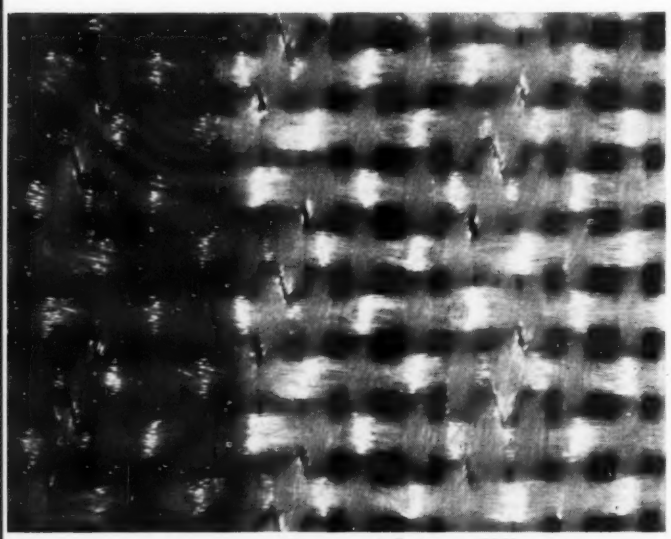
Exposure Index

The generous safety factor of 4.0 incorporated in the exposure indexes assigned to films by the ASA method has always made it possible for photographers to use higher index values than those published. Why should a careful photographer who has fairly accurate measuring devices and reliable camera equipment have to contend with excessively dense negatives just because a safety factor of 4.0 was considered necessary to keep the lesser informed *(Continued on page 67)*

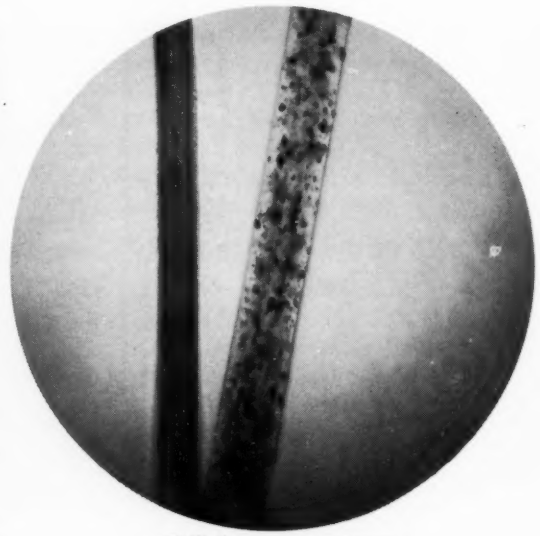
PORTFOLIO NO. 5

Interchemical Corporation's photographers and microscopists venture into eerie and unexplored minutiae of space and time

What you're looking at right now is the first item that was ever mass-produced: the printed page. For a half-millenium or so printing has challenged man to perfect the craft. Some may have thought they had reached it, but perfection is an elusive goal; they're still trying. Present day science equips people with some ingenious keys to the riddles of printing, but ironically, as printing gets better the riddles get tougher and tougher. Many of their answers lurk in matters shrouded by proportions so tiny as to be virtually invisible, or so fleeting as to be an almost perpetual blur. The Interchemical Corporation—a major manufacturer of printing inks, coatings, and related products—employs a staff of microscopists and photographers to carry on the search where human eyesight fails. The pictures in this portfolio are samples of the workaday observations by Interchemical's New York City Central Research Laboratories. The scenes are fantastic. Many of them existed only in the imagination until Interchemical trained its optics on them.



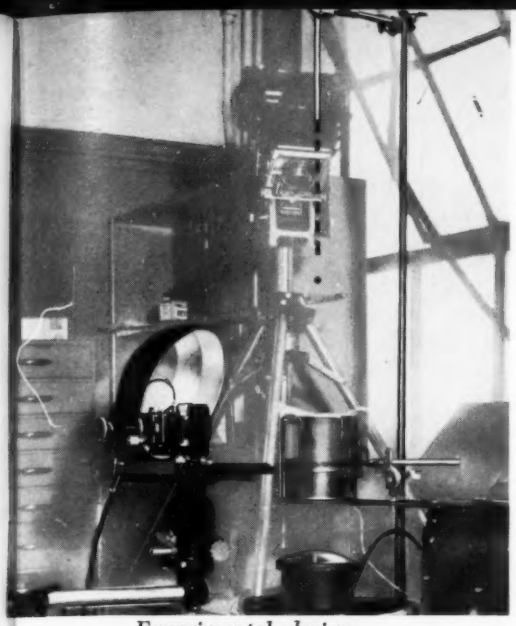
Dacron fabric at 70X



Cellulose acetate yarn

UNSNARLING THREAD PROBLEMS

Fabric prints often sell the garment. Interchemical Research makes fabric colors better. The photomicrograph *(left)* shows with exactitude how cleanly a blue printed area breaks off from an unprinted part of the fabric about the size of this: 0. The 270X photomicrograph *(right)* untangled a knotty customer relations problem. It shows how an Interchemical pigment suffered from poor dispersion; good dispersion *(left thread)* deposited even pigment throughout thread.

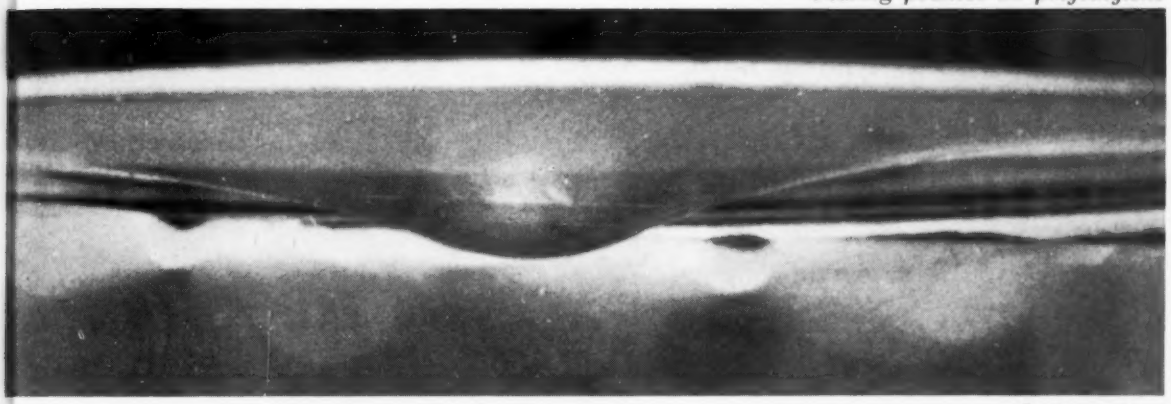


Experimental design

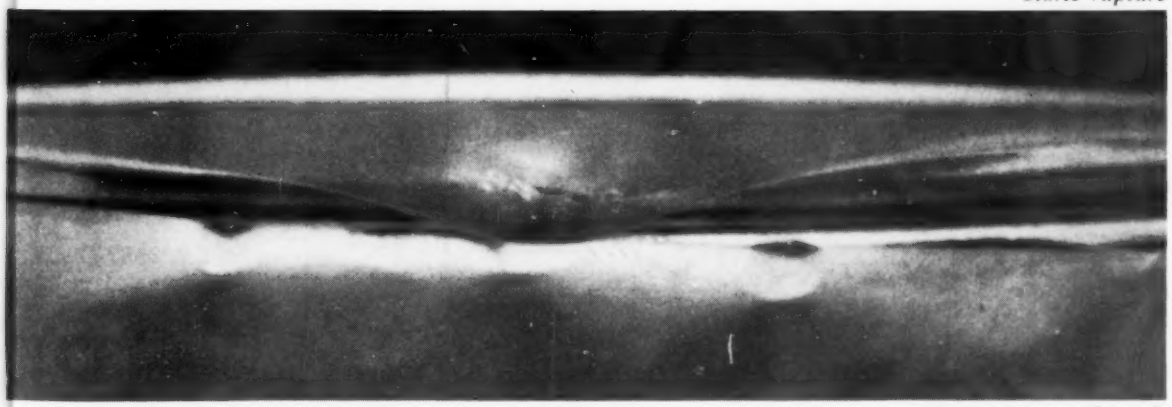
RIPPING SUCCESS

Does polyethylene split or tear? Interchemical researchers needed to know to improve printing inks for it. The Graphic and floodlight *(left)* recorded the experiment which gave the answer. Setup consisted of a tin tube, polyethylene stretched over the top, a glass tube for aiming a ball bearing at the poly, a Leica to take the pictures, a Strobalume to freeze action and a microswitch to set it off when the bearing hit the poly, which was replaced between "bombings." As you can see from the series *(below)*, polyethylene tears.

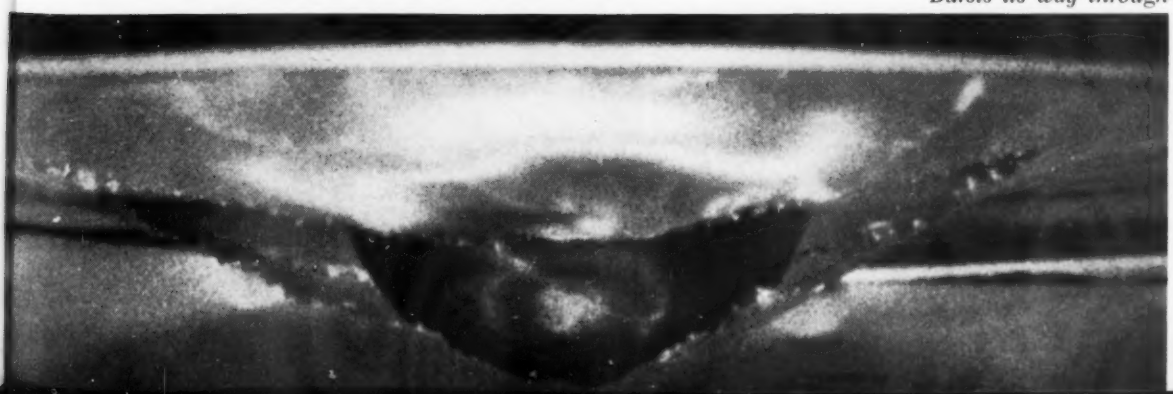
Bearing pounces on polyethylene

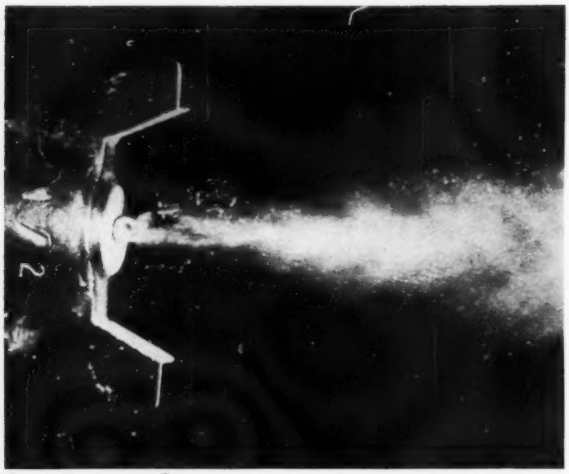


Starts rupture



Bursts its way through





Spray gun, side

Spray gun, top

BLAST PATTERN

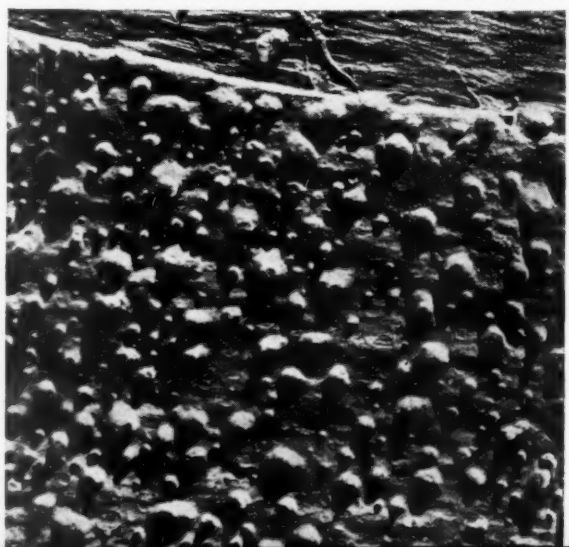
Surface tension and viscosity of a substance to be sprayed can bring satisfaction to the user or trouble to the manufacturer. The droplets must not be too big or too fine; they must be distributed in an even, controllable pattern, or else they will be next to impossible to use. The problem is similar to that of evaluating a shotgun and shell combination: the shot pattern, determined by the relationship of bore and charge, weight of shot and windage. These pictures of appliance finish being atomized through a standard commercial spray nozzle, were made with 4 x 5 Super-XX; lighting via a General Radio Corporation Microflash Unit, at 1-2 microseconds. The prints reveal to the untrained eye a nice, even spray, with good uniformity of the size of the globules, in these 1:1 views. What they indicate to scientists versed in the subtleties involved may be another matter entirely!

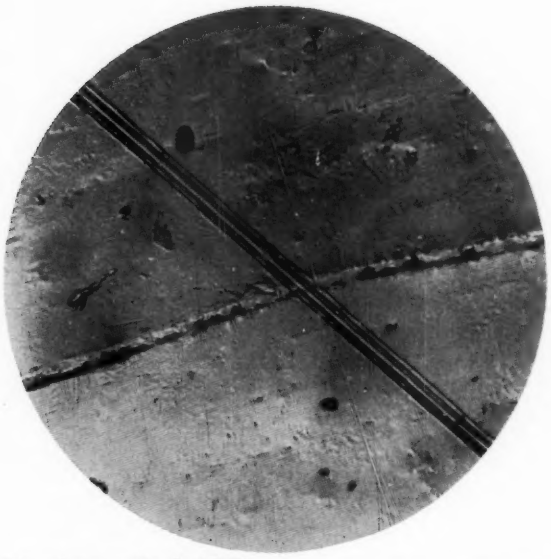
PAPER PATTERN

This raddled, wrinkled, fibrous surface is a piece of newspaper rotogravure stock, as it would appear to the monster from Mars, with the 24,000-diameter-magnifying eyes. Barring a monster from Mars, an ordinary electron microscope will do as well. The lower picture is something never before seen—the edge of a gravure dot, imprinted on that surface, also magnified at 24,000 diameters. While there have been other microscopic examinations of printing processes, the peculiar bumpy appearance of the applied ink is something of a revelation. As are many electron photomicrographs, these pictures were made on contrast lantern slide plates. The full circle of that gravure dot, by the way would be about a yard in diameter.

paper, 24,000X

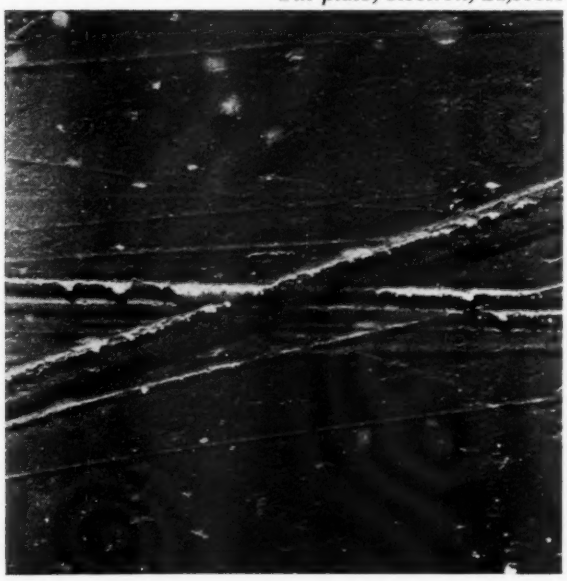
dot, 24,000X





Tin plate, optical, 240X

Tin plate, electron, 24,000X

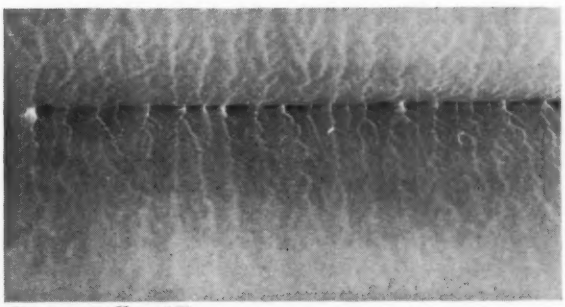


UNDER THE PAINT

What kind of paint you use is frequently determined by what kind of surface you want to paint. Interchemical's technicians have to take an interest in tinplate because the firm manufactures many coatings for application on tin. The upper picture shows imperfections in a piece of the metal at relatively low magnification. The lower one, while it looks like the same pair of lines, is of a set of striae invisible except at such high magnification. Made on lantern slide plate, the electron photomicrograph is not, strictly speaking, of the metal itself, but a "preshadowed carbon replica"—a reproduction of the subject, permeable by electrons—often only a molecule or two thick.

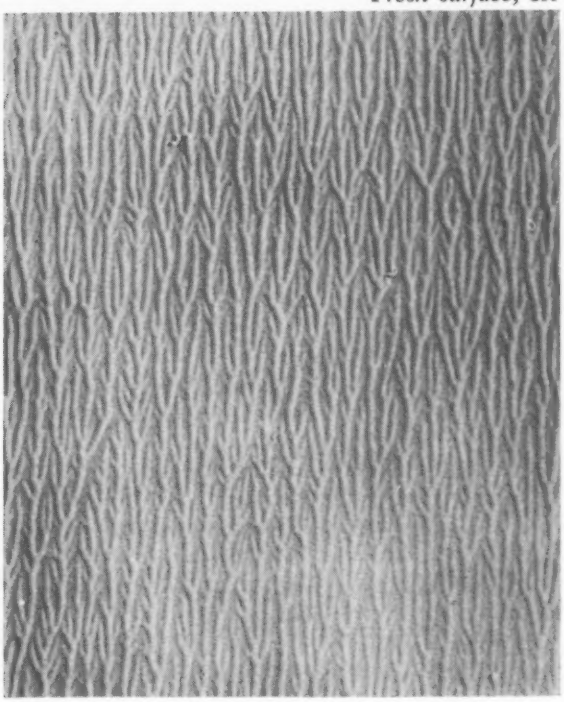
ON THE SURFACE

How smooth is smooth? Depends on how—or rather how fast—you look at it. Here Interchemical's technicians take a shutter-is-quicker-than-the-eye look at process white going on to tinplate, which passes under the coating roller at a speed of 72 ft. per min.—within a hair of 1 mph. This may not be a very inspiring speed on the open highway, but it's a fast pace at which to do viscosity research. Made on Super-XX film pack, these studies show the tiny ridges of the "coating pattern," which would be fatal if they hardened. If the material is correctly designed for the process, the coating pattern should disappear entirely, leaving a totally smooth surface—within 30 sec. If not, chemists have work ahead of them. But that's how progress progresses!



Coating roller, 3X

Fresh surface, 3X



PICTURE CREDITS: L TO R; P. 42, ELIZABETH MITCHELL, H. B. BERG; P. 43, J. W. HOWARD; P. 44, J. W. HOWARD, M. B. VOEKEL; P. 45, H. B. BERG, J. W. HOWARD.

FAST WORK TURNS OUT 1-CAN EPIC

"The midgets are coming!" was the rush call that alerted the Consolidated Edison Co.'s photo staff. In under a week Bill McDermott and colleagues turned out a 9-minute thriller on work simplification, underground steam lines, 102 broken turbine blades, and two midgets who never turned up.

It often takes a split-second decision on an executive level to get the most out of an in-plant photo department. Furthermore, it's a top notch photo department that can respond to a rush call with a little classic—a hard-hitting, low-budget nine minute movie that works equally well for the company's work simplification drive, its community relations and sales program and its recruitment campaign.

This is exactly the job that was turned out by Advertising Picture Chief Bill McDermott and his associates at the Consolidated Edison Co., the vast organization which provides New York with gas, electricity, and steam.

"Low-budget" and "split-second" are not used lightly. Complete with editing, synchronized sound and voice and a release print, the entire job cost $210. Assigned by work order on Thursday, the script—nine pages, longhand—was written and approved, camera crew alerted and lighting equipment hired by Friday and all the necessary footage shot by the close of business on Monday.

A product of New York City College's Institute of Film Techniques, McDermott is a triple-threat man in a film studio or on location. In this case he not only designed the production, but wrote the script ("Fortunately I have a very legible handwriting") and with cameraman Mike Saladino, shot the footage as well.

The story itself was a beaut. During overhaul of a 160,000 KW generator at Con Edison's Hell Gate Station—second largest steam electric generating plant in the world—the turbine cover was removed as part of a routine inspection. To the great dismay of the inspector, 102 turbine blades were found to be broken off. These averaged 10 oz. in weight and 5½ in. in length. After a careful search, some fifty of the blades were discovered lodged in the machine itself. Fortunately they had not done all the expensive damage they might have done to moving parts.

However there were still fifty-odd pieces of steel at large, and their capacity for destruction was limited only by the value of the turbine. It was vital to find them, and there was only one place they could be lurking; the 18 and 20-in. steam admission lines. There were four lines, running for 70 ft. underground, beneath the turbine. Cost of dismantling the pipes for inspection and cleaning: 1,600 man-hours; $5,000.

Charlie O'Neil, General Superintendent of the Station Construction and Shops Department was sure there must be an easier way. As the script unfolds the thrilling saga.

O'NEIL MAKING CALL TO THORNBLADE

He suddenly remembered that Bert Thornblade

Danger signal: 102 missing turbine blades. They can do unlimited damage to equipment.

They aren't in the casing; must be in steam lines, a $5000 retrieving job! Unless—

Six-foot midgets to the rescue. First—what do we look for down in the pipes?

Feet first—a tight fit in an 18-in. pipe. A bucket will follow him.

Head first—no-one but his buddy is trusted to handle the lines on this tricky job.

Seventy feet under the earth in an 18-in. pipe, looking for bits of killer metal.

All rounded up at last—with a cool $4900 saved. They found a better way!

had mentioned something about midgets being used to clean small diameter pipes.

THORNBLADE ON PHONE

Bert recalled telling O'Neil about the midgets and also the name of the company.

O'NEIL WRITING

Charlie O'Neil's mind was wide open—here was one name he was glad to get hold of.

CU MIDGET CO. NAME

"The Centriline Corporation"—a few more phone calls and then . . .

Two six-footers arrived at the Hell Gate plant. They were specially trained, and could reverse their position in a 24-in. pipe. The rest of the picture shows how they went down into the steam lines—with the temperature on the turbine room floor reaching for 120°—found the missing blades and brought them up. The sound track (spoken by McDermott himself) comes to a triumphant conclusion:

Not two hundred man-days—but just one hour *from the start of the job the men left Hell Gate. Charlie O'Neil and the men of Station Construction and Shops had found a better and easier way —and the cost? Not $5000 but $100.*

The movie was called "Find a Better Way." Facing Bill McDermott were a few problems that would lead any movie maker to seek a better way—to make a living. First of all, there was the question of speed. By the time he heard that the two supposed midgets were coming to crawl through the steam feed lines, he had only one clear working day to get his plans under way. And it was not merely one of these if-you-get-it-fine-but-if-you-don't-don't-worry-about-it jobs. The order came directly from the Chairman of the Board of Trustees; the work simplification program was not only the Chairman's pet project, but at the moment the featured subject of the company's Supervisory Training Program.

Moreover there were technical problems, not the least of which was that of making a movie inside an 18-in. pipe. This was solved very neatly by writing around it. There are actually no shots of the men in the pipe itself. That part of the story is engagingly handled with an animation sequence. What McDermott did was to get the art department to draw a view of the pipes on heavy illustration board. Part of the pipe was cut out, and a paper chute constructed in back of the cut-out. When it became necessary to show what went on inside the pipe, a little figurine was let into the paper chute at the end of a string. Anyone who has ever bought modeled figures for animation or table-tops knows that their cost can sometimes be staggering. *(continued on page 54)*

WILMER S. GOFF, North American Aviation Inc., Columbus, Ohio, used three teleflash units, four flashguns and a time exposure for this brilliantly lit outdoor picture of a jet which ultimately appeared in *Skyline*, North American's house publication. Goff set up two teleflash units at the plane's left side while he cross-lit the nose with the third. Teleflash units with No. 5 bulbs were triggered during 15 second exposure at f/11 on Royal-X Pan by a flash on the camera. During exposure men in picture fired their flashguns with No. 8 bulbs.

RICHARD ALTHOFF, free-lance photographer, Flushing, New York, is compiling a complete story on skyscraper construction. He photographed Ralph Hackett, of Slattery Construction Co., who checks for weakness or damage of existing walls, street foundations (note wall with severed lines used as a background). Althoff's Rollei with Tri-X was set at f/22, 1/250 sec.

TED MATHEWS, Simmonds Aerocessories, Inc., Tarrytown, N. Y., shot fuel injection nozzle spray pattern with 4 x 5 Graphic View, 8½-in. Ektar open on "T." Timing circuit triggered a Heiland electronic flash unit at instant of spray.

RICHARD D. BUCHER, Allis-Chalmers Manufacturing Co., Milwaukee, Wis., silhouetted an HD-6 tractor entering a uranium mine at f/32 and 1/50 sec. The 8 x 10 Deardorff with 9½-in. Dagor was loaded with Royal-X pan. He darkened the sky with a K2 filter.

R. S. JOHNSON, Ford Motor Co., Dearborn, Mich., wanted detail in the welder, not just a picture of the arc itself. He used one No. 5 flashbulb high and to the right with his Speed Graphic. Shot in fabricating shop was made on Royal-X pan, 1/50 sec., f/16.

PMI's Monthly

READERS' SHOWCASE

Five of PMI's readers supply pictorial solutions to industrial photo problems.

What makes a photograph good? In industrial photography, two qualities are essential. First, the photograph must fulfill its obligation as a functional picture. Secondly, it should be good pictorially. If the picture doesn't meet requirement one—function—its pictorial appeal won't save it from perpetual incarceration in the picture file, remembered, loved and never used. The major portion of PMI is frankly devoted to the function *cum* form photograph. However, on these two pages given over directly to the photographer's choice, you're the boss and picture editor, free to send in the picture that made the grade or those other shots that didn't but you think are tops pictorially, be they photo reportage, portraits, Schlieren photographs, photomicrographs or what have you. Who knows, we might even print a red hot Ozalid if it's good enough. What'ch got in your files?

You are invited to send in your pictures for this feature. Here are the details:

There are two rewards for each of the pictures chosen. The first is knowing that your picture will be seen by appreciative fellow professionals. The second is $10.00. Please include your name and your company's name, a note about the picture and how it was used, and the technical data. Send them to SHOWCASE, PMI, 33 W. 60, New York 23, N. Y.

WHITE PRINTS: SHORT CUT TO SERVICE

Known in technical circles as the diazo process, this reproduction system based on ammonia development gives useful multicolor prints

Console white printer

"The photo lab that fails to make full use of the diazo reproduction process may be overlooking one of the most important and versatile tools at its command," says Howard Hood, Supervisor of the Applied Research Operation Photo Lab at General Electric Company's Flight Propulsion Laboratory Department in Evendale, Ohio.

Hood relies on diazo to expand the range of services his lab can offer to other GE groups, such as the engineering and marketing departments; to solve technical problems that sometimes arise in specific engineering projects; to save time for company personnel and to cut his own departmental costs.

How, specifically? Hood lists the following uses of diazo reproduction in his lab and explains how each is handled:

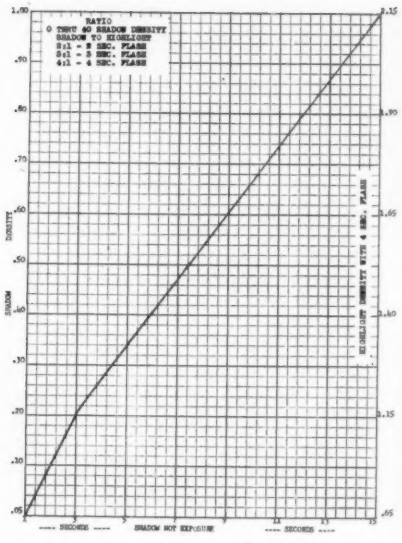
As an example of the type of project on which diazo reproduction can be an important aid, Hood cites a recent experience.

"We were asked to make a schlieren photograph of a heavy shock wave built up in front of a compressor blade in a wind tunnel test. It was desirable to see the various densities in the schlieren photography but these were not very apparent in the black-and-white photo. Since we did not have a color schlieren setup the diazo process was used."

To solve this problem, Hood and his staff made a black-and-white photo, then measured the density of four different density areas. Four strips of black-and-white film were then exposed according to appropriate degree of density and a positive film made. A copy of each was run on the Ozalid reproduction machine on colored Ozalid film, one color being used for each area of differing density. An overlay of the four colored film strips then gave the project engineers a more precise picture of the shock wave.

To cut costs: A saving of more than $16,000 was made in this photo lab during the first five months of 1957, through using 8 x 10 Ozalid prints rather than photographic prints whenever possible.

Matte film positives save time for engineers, who draw changes. Lab runs prints for them in minutes.



Densitometric readings are used to translate black-and-white negative into Ozalid color overlay. Graph, *center* was worked out through trial and error to insure consistently good results in making of screens. Screen positive of negative is made whenever three or more prints will be needed. Process saved GE lab $16,000 over five-month period.

As Hood explains, "Whenever we know that three or more prints of a negative will be needed, and if the photo is not one in which the finest detail is important, we make a screen positive of the negative, in order to use Ozalid reproduction. During this five month period we made 34,500 of these prints as against 10,000 photographic prints, at a saving of about 47¢ each. This, of course, was a tremendous factor in cutting costs."

In order to simplify the making of screens from negatives, and to ensure good, uniform results each time, Hood has constructed a graph, based on a Kodak step tablet table and tested by trial and error to work effectively with his lab's Elwood 8 x 10 enlarger.

After taking a density reading of a negative it is only necessary to glance at the graph. This indicates the shadow density exposure and the maximum highlight flash exposure to be used to bring up the highlight dot without enlarging the shadow dot.

The negative is placed in the enlarger and projected on Kodak 133 line Auto-Screen film. This positive is then exposed to a weak yellow light for the amount of time indicated on the graph.

What about shooting a screen or line negative and reverse developing to a positive? Hood has had fair results with this technique; its use saves a substantial amount of time. The film is developed to a negative, then rinsed in acetic acid, washed, and then put into an etch bath to bleach off the negative image. Another wash and then an exposure to light and a second development is used to bring out the part of the film that was not originally developed, and to produce the positive needed for Ozalid reproduction. To save time: "Draftsmen and engineers frequently want to eradicate parts or drawings and put in new lines," Hood explains. "This, of course, is a time consuming procedure, and either calls for a completely new drawing or the tedious reconstruction of one already made.

"To save them time and lighten their work, we simply make duplicate positives on matte film for their use. They can eradicate where desired and draw directly on this material. We then run prints of the 'new' drawing for them in a matter of minutes."

The marketing people in Hood's department also benefit from the time saving made possible by the use of Ozalid reproduction.

Hood explains, "In the past, whenever marketing had a drawing that they wanted to use it had to be scaled down by an artist. This was a long process, of course, and a costly one, labor-wise. Now, however, we can run these through on the Ozalid machine giving them a scaled down print in about ten minutes."

Here's how this is accomplished: The material is put on the copy camera and photographed on extra thin projection positive paper; developed, washed and dried in eight minutes. The picture comes out reversed *(continued on page 52)*

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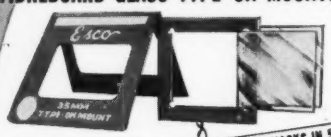

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WHITE PRINTS

(continued from page 51)

ready to run emulsion to emulsion through the Ozalid machine.

"Of course, it would be possible to do this without using the Ozalid process," Hood points out, "but it would be much more difficult. We would either have to set up the copy camera like a photostat camera or lose the sharpness of the image by shooting through the paper. Then, of course, prints could be made from photographic film but would involve a great deal more cost and time."

Sorting it out

To increase clarity: As anyone knows who's ever tried to read a comparison graph by consulting each sheet separately and comparing them mentally, it's impossible to get a clear picture quickly. Hood, however, has been able to use his lab's Ozalid machine to eliminate this condition. Overlays, made on Ozalid film, will show up to seven different colored comparison charts at a glance.

To make these, he simply lays onion skin paper over the top of the graph to be reproduced, and draws over its lines. Or he photographs and opaques out unwanted material. This is then reproduced on color diazo film. Stapled together, the transparent overlays give the reader a clear picture at a glance.

"This could not be done so inexpensively by any other method," Hood points out. "And these overlays are usable on Vu-graph projectors for meetings, as well as for the individual's quick clarification.

Quick glamor

To glamorize reports and talks: The inexpensive use of color which the Ozalid process makes possible, permits the photo lab to serve plant personnel.

Take its applications to report covers, for example. Before the Ozalid machine was used for this purpose, report covers for small distribution did not justify the expense of having color separation plates made, and were limited to black-and-white. Now, however, it is possible to add eye appeal to this material at a cost of approximately 80¢ apiece—in contrast to the expense of several hundred dollars for printed color covers.

To accomplish this, Hood and his personnel make up the positive either by gluing letters to a clear sheet of film or drawing them up on a board and photographing them. The positive is run with the paper through the exposing section of the machine and then color couplers (of which there are five) are rubbed on with a piece of cotton, over the spot each color is wanted. Upon exposure to ammonia fumes in the developing section of the machine the letters turn the color desired.

Slide work

Still another use of the Ozalid color process is in making 3¼ x 4 colored slides used for illustrating talks by GE personnel.

"These take about 15 minutes to make up, as against two hours to turn one through photographic color processes, and three Ozalid slides can be made for the cost of one standard color slide," Hood points out. "Too, they are not only quicker to turn out and less expensive to handle, but have wide range of versatility.

"We can produce a large number of different color combinations by using the Ozalid process and because they are from black-and-white drawings art time is saved by doing away with the coloring."

Typing too

In addition to illustrating drawings in color, this lab also makes color slides designed to point up facts and figures. Positives for these slides can be made by setting the typewriter on "stencil" and typing on orange stencil paper (Aulta Mimeograph Stencils). Strips of solid color Ozalid film can then be put over the stencil and made into slides. Because the carbon paper blocks out light, a black screen with colored letters results. The stencil can also be used as a positive and printed on color Ozalid film. In this case a colored screen with white lettering is the result.

If colored letters on a white screen are desired, the positive is simply typed on onion skin paper, backed with orange carbon rather than directly on the orange stencil.

Versatility plus

"There is almost no end to the variations which we are able to produce by taking full advantage of the versatility of Ozalid reproduction," Hood sums up. "And because the process is cheaper, we cut our own costs and make possible the utilization of our services more freely. As a result, we get more work than we otherwise would, and are able better to serve the personnel in our plant."

THE END

Herbert P. Paschel, PMI's graphic arts and reproduction expert, is always ready to tackle readers' problems in those fields. Address him c/o PMI, 33 West 60th Street, New York 23, N. Y.

(continued from page 31)

wastebasket yet and play around with some color sheets to see what they can do.

While on the subject of exposure, if you're not quite sure of the proper one in color or black-and-white bracket exposures. I don't think I've ever taken a color shot without making a few insurance pictures at other settings. This has been particularly helpful when I have shot color with electronic flash.

So much for the lighting equipment and actual exposure itself. I'd like to talk a bit about one of my greatest aides in in-plant photography—the reflector. Of course, if you were shooting all your work under studio conditions you could assemble as many lights as you need. On location within a plant where portability is rather essential, good reflectors can help you out of a number of tight spots. Cardboard sheets 40 × 60 in. covered with aluminum foil tacked down with tape, will do nicely. Reflectors enable you to cut down contrast by lighting up shadow areas. They are especially useful on modern, industrial steel structures where all the equipment is exposed and light is very contrasty. Sometimes, by using two reflectors, one illuminating the other in relay, a dark spot forty or fifty feet from the light source can be opened up.

Portable background

Here's a home-built lighting aid I have found to be very useful. Make two 4 × 8-ft. panels of ¼-in. plywood or some light wallboard material. Paint one side white and the other a pastel shade. Such panels function as temporary walls on location. Many exciting shots of equipment and people become confusing because of messy backgrounds. These panels can be set up quickly so you can shoot from a chosen angle and eliminate distracting backgrounds. In color photography you can use the pastel side of the panel to add color to your picture. By throwing a colored light onto the white side of the panel you can change the color of the background to suit your composition.

These panels came in very handy not long ago when I shot a laboratory that had windows in the background. These windows distracted from the important subject—carefully lit laboratory equipment—so I screened them off with panels.

A portable background won't solve every messy situation. In many industrial operations the equipment does not stay clean or freshly painted for long. Management, however, does not like to see dirty or badly worn equipment in pictures, and in color photography such equipment looks even worse than in black-and-white. A little cleaning up before the shot will help. The photographer can always count on the cooperation of the foreman who likes to show off his operation. Sometimes he will even repaint a piece of equipment that is not being used at that moment. This will help the picture, even if it concerns only a few valves or several pipes. It takes only a few minutes, but the result can be very gratifying, especially when color photography is involved. A blue valve on an otherwise black machine will relieve the monotony.

Brightening color

Photographing black equipment in color is a nightmare. For a variation, try lighting it using color gelatins in front of your lights. The colored light will give the black equipment some interesting color highlights. Keep the light away from people in the shot, however. THE END

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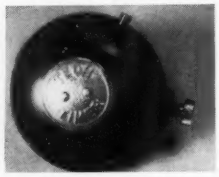

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1-CAN EPIC

(continued from page 47)

McDermott's cost him one dime. In the local ten-cent store he discovered a tin soldier representing an infantryman firing from the prone position. A couple of snips with the wire cutters and his rifle was out of the way.

The location itself presented some problems. Though generating plants are generally spacious, McDermott found that the area in which he had to shoot was crowded with parts of the dismantled generator and turbine. The opening for the steam feed line was in the heart of the turbine, and when the really dramatic action was taking place the area was so crowded with workmen, line tenders and technical help that there would have been no room for lights and camera crew.

"We solved that one by lighting the place like Madison Square Garden: five rented 5000-watt spots hung high over the action, like the lights over the ring at a fight," says McDermott. "We had a few smaller spots for fill-ins but we seldom had time to position them or space to position them into."

The negative was shot with a Cine Kodak Special II, on DuPont 931. Work print was made and edited from the original. Meanwhile McDermott recorded a sound track. The cut print and track went to Precision Labs in New York, who made a fine grain and one release print. Elapsed time: less than one week.

Shown as part of the work-simplification program, "Find a Better Way" created so much talk that pretty soon Con Edison employees were coming in to the public relations staff and requesting prints to be shown at their churches, club meeting, and so on. The community relations people smiled upon semi-public distribution of "Find a Better Way" because what better way was there to get across the idea that Con Edison is an efficiently run public utility. Staff recruitment officials were pleased because the film showed that Con Edison employees were interested in their jobs, which, in turn allowed plenty of scope for ingenuity and resourcefulness.

So many requests for "Find a Better Way" came in that four more prints had to be made to fill the demand; a demand that shows no sign of slacking yet.

Not a bad return on a cash investment of $210 and less than a week's work. THE END

SLIDE QUALITY

(continued from page 38)

slide. Here choice of pen points is important. We use a No. 2 size to draw grid and leader lines; No. 4 for axis or reference lines; No. 6 for curves; Nos. 4, 5 or 6 for sketches or diagrams; No. 5, in conjunction with a 350 or 290 template, to draw titles.

We make scales, captions, numbers, notes and labels with a No. 4 pen, and a 290 or 240 template. We have found that the minimum size template to use—and that only when necessary—is a 200 template and a No. 3 pen. Our department employs these pen and template sizes on art work that measures 9½ x 7¾ in. The slide is prepared by copying the completed drawing on color or high-contrast black-and-white film.

Fototype is another method for putting lettering into art work. This product consists of two basic components: 1. A rectangular metal tray filled with perforated pads of pasteboard letters, each letter easily detachable from its mounted position, and 2. A long ruler-like composing stick, which serves to hold the pasteboard letters in strip form for the spelling-out of words.

Movie title lettering kits. These come in a variety of sizes, colors and materials, our favorite being the one with flexible plastic letters. We mount these on glass or clear plastic. Live subject matter or art work is used as a background. We have produced any number of effects with this combination.

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The procedure is this: set your lights using either 100-watt bulbs or No. 1 photofloods (we recommend photofloods when using bounce so that you get sufficient light level for your meter to read). After lighting has been placed, use the meter to obtain a light level reading. Have your meter set for *exposure index for the color film* you are using. Here is the conversion system which we have found accurate empirically for open flash exposure.

If 100-watt bulbs are used, the correct f-number for No. 50 or No. 3 flashbulbs will be found opposite the 50-second mark on the meter. If you plan on using No. 22 flashbulbs the proper f-stop will be opposite the 32-second mark.

If No. 1 photofloods are used instead of 100-watt lamps for the meter reading (this may be necessary when existing light level is too high to obtain readings with 100-watt bulbs); the proper f-stop for No. 50 or No. 3 flashbulbs will be found opposite the 6-second mark on the meter. For No. 22 bulbs, it will be at the 4-second mark.

After readings have been taken the flood bulbs are removed and replaced with flashbulbs. (Caution—make sure that the current has been disconnected first.) If the flashbulbs are to be fired by house current we recommend that the circuit be fused with the slo-blow type fuse, such as a Fusestat, to withstand the short surge of current.

We recommend you bracket your exposures by ½ stop at least the first time you try this method of exposure. We have found that photographers read their meters differently so that manufacturers' exposure indexes may be slightly high or low. Using the 18 per cent reflection grey side of the Kodak Neutral Test card helps standardize the reading.

35mm Kodacolor

We have run some preliminary tests on the new Kodacolor 35mm film. The film has the same excellent color characteristics as Kodacolor roll film. Its exposure latitude is excellent. We obtained easily printable negatives exposed from 1 stop under to 1½ stops over. Using one negative we made several different diameter enlargements. It was practically grainless up to 5 x 7. At 8 x 10 grain was apparent, but far from objectionable. The 11 x 14 enlargements showed more grain which may be objectionable with certain subject matter viewed close up.

We still find quite a bit of poorly exposed film coming in for processing every day. In most cases the fault lies in erroneous exposure calculation, but we also find some color films improperly rated, although within the manufacturers' stated tolerance of plus or minus ½ an f-stop. Our experience has shown, for example, 120 Ektachrome is ½ stop slower than 35mm, and photographers get better results by rating the Ektachrome 120 at 24 instead of 32. On the other hand many of the Super Anscochrome emulsions seem a quarter stop faster than recommendation. THE END

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PROGRAM OUTLINE

Edward J. Ellis, Ford Motor Company
How to Photograph the Boss
Herman B. Ellis, Mackinac Bridge Authority
Photographs in Bridge Construction
David B. Eisendrath, Jr.
A Look at New Products
James E. Hampson, Arkansas Fuel Oil Company
Methods and Techniques Forum
Robert R. Goodwin, General Electric Company
Remote Photography
Henry J. Survilas, Arthur D. Little, Inc.
Solving Scientific Problems with Photography
Peter Jowise, Shell Development Company
Unique Problems
Joseph Tholl, Examiner of Questioned Documents
Photo Examination of Questioned Documents

Earl Mercier
Ballistics Photography
Ted Gable, Photo-Art Commercial Studios
The Commercial Photographer in Industry
Edward H. Paeltz, Laclede Steel Company
Advertising Your Photo Lab in the Plant
R. W. Anderson, Dow Chemical Company
Do You See What You Are Overlooking?
Michael J. Scilingo, Ceco Steel Products Corp.
How to Sell Your Company on Needed Equipment
Robert H. Haack, Southwest Research Institute
Industrial Photo-Documentation as Applied to Automotive Road Test Programs
Joseph C. Gonzalez, The Procter & Gamble Co.
The Photographer and the Engineer

Norman Salmons, Eastman Kodak Company
Planning and Producing Visual Aids
Henry Holmes Smith, Indiana University
Communication Through the Photographic Image
Lee A. Ellis, Raytheon Manufacturing Company
How to Prepare a Presentation
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FREE LITERATURE

For additional information on any free literature item, circle the appropriate number on the readers service card attached, opposite page

AUDIO-VISUAL

Lightproofing **202**

Bar-Ray Products, Inc. Catalog sheet gives descriptions and prices of lightproof shades, louvers, darkroom ventilators and lightproofing material.

Arc Lamp Projector **203**

The Strong Electric Corp. 4-page folder includes projection table for various focal length lenses, information on the Strong Universal arc lamp slide projector.

Brilliant Screens **204**

Schultz Manufacturing Co. 4-page catalog lists projection screens and light stands, charts projector-to-screen distances for various focal length lenses.

CAMERA & LENS

Lens Resolution **206**

Burleigh Brooks, Inc. 4-page folder offers a technical discussion of resolution and contrast as a means of evaluating the quality of photographic lenses.

EQUIPMENT

Durst Enlargers **207**

Hanimex (U.S.A.), Inc. 24-page catalog of technical data and special features of eight models of the Durst Enlarger-Copy Camera.

LogEtronics **209**

LogEtronics Inc. 4-page folder describes use and application of the LogEtronics automatic dodging and automatic exposure control system for printing photographic and X-ray negatives.

Electronic Flash Exposure **210**

Eastman Kodak Co. 6-page pamphlet offers a method for determining guide numbers, gives a guide to exposing Kodak films with portable electronic flash units, and discusses electronic flash techniques.

Lighting **211**

Sun Ray Photo Co., Inc. Brochure lists Sun Ray lighting equipment, tripods and camera and studio stands.

Developing Tanks **212**

Met-Pro Inc. Catalog sheet lists Metprolite plastic processing equipment for color or black-and-white sheet film, including water jackets, insert tanks, light-tight floating and dust covers.

Light Stands **213**

American Photographic Instrument Co., Inc. Catalog sheet of Pic anodized duraluminum light stands, tilt heads, background holders and accessories.

Repetitive Speedlight **214**

The Speedotron Co. Catalog sheet on unit to adapt electronic flash for repetitive and continuous light for viewing and focusing.

SUPPLIES

Ilford Multigrade **215**

Ilford Limited. 8-page booklet treats characteristics and printing technique of Multigrade multiple contrast photographic paper.

Photo Chemicals **216**

Philip A. Hunt Co. 34-page list tabulates photographic and graphic arts chemicals in all quantities available through this firm.

Ektacolor, Type L **217**

Eastman Kodak Co. 4-page data sheet describes Kodak Ektacolor, Type L (long exposure negative color film) and Kodak Panalure Paper E, panchromatic enlarging paper for making black-and-white prints from color negatives.

GRAPHIC ARTS

Cronar Films **218**

E. I. duPont. 4-page data sheets include sensitometric characteristics, filter ratios, exposure and development information on four Cronar polyester graphic arts films: Transparency Color Separation Negative, Reflection Color Separation Negative, Pan Litho, Pan Masking.

MOTION PICTURES

Butt-weld Splicer **221**

Prestoseal Manufacturing Corp. Folder gives prices and specifications of the Presto-Splicer for butt-weld splicing of motion picture film, microfilm and magnetic tape.

Lite-Lift **222**

Century Lighting, Inc. Catalog sheet describes the Lite-Lift, a counterbalanced device for raising or lowering photographic spots and floods suspended from the ceiling.

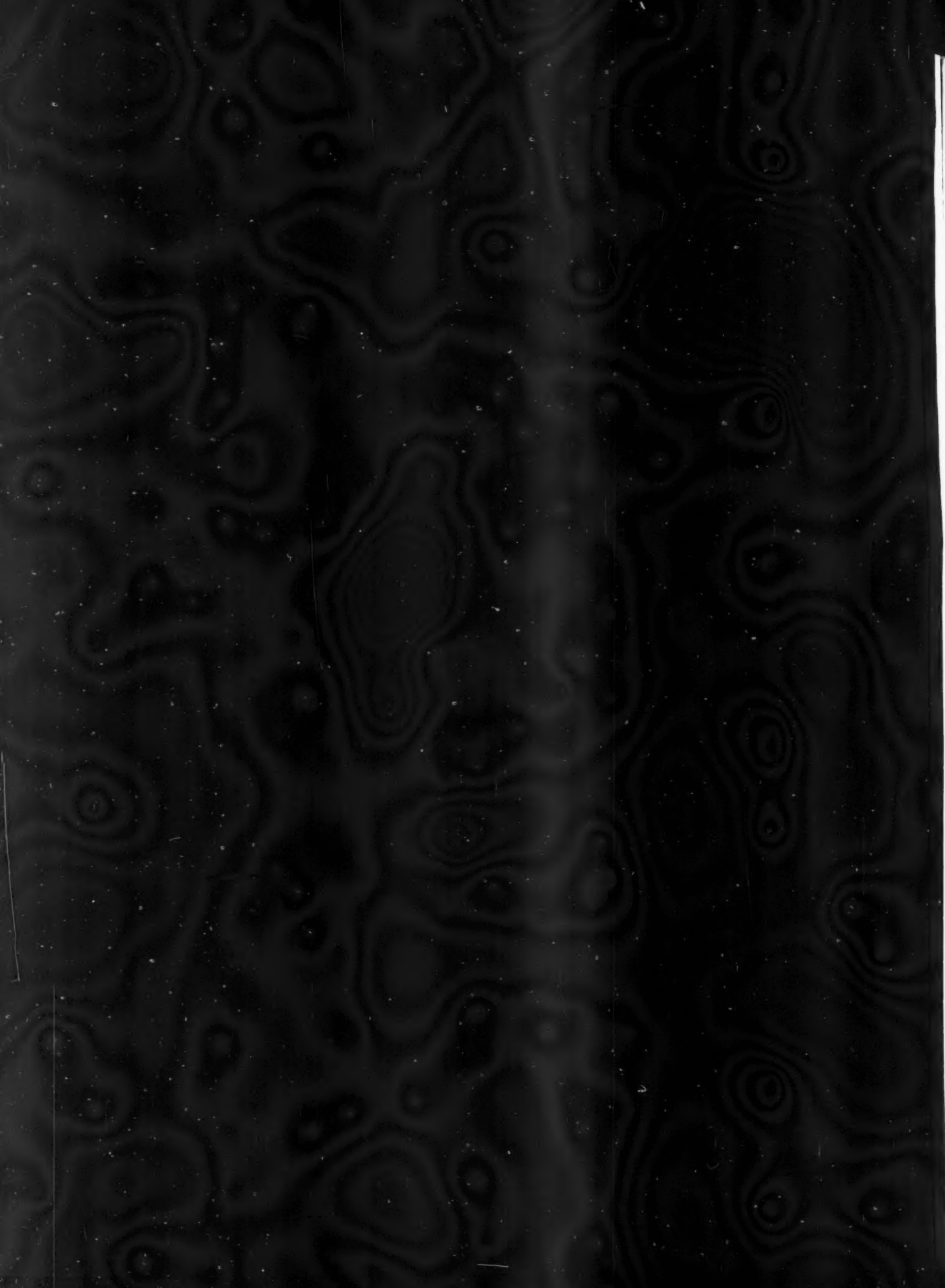
Film Coating **223**

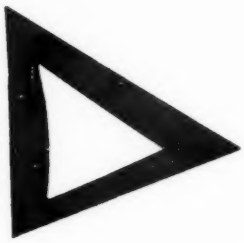
Micholson Products Co. Catalog sheet on Tuff Coat, cleaner, toughener, scratch preventitive and lubricator for motion picture film.

SERVICES

Color Price Lists **224**

Meisel Photochrome Corp. Two price lists, one on transparency services, one on negative color and Type C print services offered by this Dallas, Texas, color processor.





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NEW PRODUCTS

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New Mike 118

A polydirectional Condenser Microphone, the AKG Model C-12, especially designed for FM, TV, high fidelity recording and sound film studios has been announced by Camera Equipment Co., Inc., New York. It features a switch box for the remote control of directional characteristics, providing omni-directional cardioid, figure 8 and 6 intermediary patterns.

Frequency response is from 50 to 10,000 cps (plus or minus 2.5 db) and from 30 to 15,000 cps (plus, minus 3 db). The frequency range is from 20 to 15,000 cps.

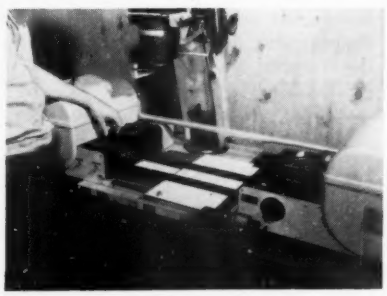
Photo Trays 109

Produced from high-impact "Cycolac" plastic, a new line of photographic developing trays has been introduced by Columbian Enameling & Stamping Co. The new trays offer whiteness, smoothness, resistance to all normal photo processing solutions and near indestructibility.

Tray capacities: 8 x 10, 11 x 14, 14 x 17, 16 x 20 and 20 x 24-in. prints, plus four sizes for fixing baths.

Roll Easel 117

Pako Corp., Minneapolis, Minn. announces the Vanpak Roll Easel which offers automatic printing on roll paper up to 10 in. wide and can



be used with commercial type enlargers for color as well as black-and-white.

Prints ranging from ½-in. sq. to 10 in. sq. can be made. A print size selector in ¼-in. graduation plus a pre-set timer permit the easel to be operated in conjunction with automatic exposure computers. A light-tight focusing screen and a mask permit full composition of prints without danger of paper waste. When enlarging black-and-white prints, the Vanpak Easel will accommodate a 1000-ft. roll of single weight or a 500-ft. roll of double weight paper.

New Microfilter 115

The new Oscar Fisher Microfilter employing the new sintered metal principle can be cleaned by reversing the flow of water momentarily; this is accomplished by a twist of a petcock.

The Fisher Microfilter is all metal, said to be easy to connect by using standard half inch pipe fittings, has a permanent filter core housed in a

brass cylinder, delivers 10 gallons of water per minute. Where larger quantities of water are required, two Microfilters can be installed in series doubling capacity.

Golden Starliter 400 116

A new studio electronic flash unit features an automatic voltage stabilization system of plus or minus two per cent. Power selector switch is adjustable from 25, 50, 100, 200 and 400 watt-seconds. Modeling lamp intensities are switched simultaneously with flash intensities. Weight of complete modeling unit is 25 lbs. Flash duration at 400 watt-seconds is 1/250 sec. Charge time is 10 sec. at 400 watt-second and 2 sec. at 25 watt-second.

Polarized Flash 110

The Enteco Polariflash flash screen polarizes the light from flashbulb or speedflash, checking the causes of glaring reflections. The screen slips onto any 5¼-in. or smaller flash. It swings aside for replacing bulbs.

The Enteco Polariflash is of shatter resistant laminated glass construction and is priced at $10.95.

Microfilm Unitizer 111

A new microfilm printer—which permits microfilm users to unitize from original roll film to Actifilm sheet or to Filmsort aperture card or from Filmsort aperture card to Ozacard—has been introduced by Microline Products Group, Ozalid Division, General Aniline and Film Corp. The Unitizer reproduces and unitizes in one simple dry operation. Development is handled by any standard ammonia machine or a simple, inexpensive companion developer.

Exposure time is slightly less than a minute. The printing-exposing surface is 35mm x 8 in. which permits duplicating three aperture cards at a time. The Unitizer operates on 115 V 60 cycles. Dimensions are 18¾ in. long, 7½ in. wide and 6¾ in. high.

New Beseler 114

The new Beseler 45H provides a free working area on the baseboard for enlargements up to 16 x 20. For optimum condenser coverage on negatives smaller than 4 x 5 down to

8mm size, an interchangeable accessory is available for quick adaptation to a special "split-bellows" assembly. Among other features of the new Beseler 45H are: a controlled tension negative stage that locks into a light-tight unit for any position and opens without moving lamphouse or condenser assembly, a standard 4 x 4 lens mount serves the complete range of enlarger lenses from 2 to 6¾-in. Price is $179.50 ($188.50 Denver West).

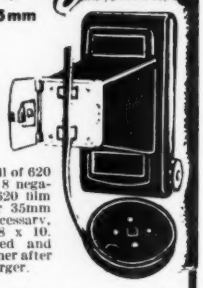
Quick Splicer 120

A new motion picture film splicer enables the user to automatically butt splice either 8 or 16mm film

Cinélarger

8mm • 16mm • 35mm

Permits still prints to be made from 8mm or 16mm movie films, or from 35mm color slides. **Cinelarger** makes negatives from either black and white or color positives, onto No. 620 roll film.



16 negatives from one roll of 620 film from 8mm Movies. 8 negatives from one roll of 620 film from 16 mm movies or 35mm slides. Cutting film unnecessary, good enlargements to 8 x 10. No. 620 film developed and printed in standard manner after exposing with the Cinelarger.

8mm Model...$19.95 16mm Model...$19.95
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COPY STAND

NEW economical copy stand. Suitable for all cameras from 35mm to 4 x 5. 16 x 19" baseboard. Two-piece 38" chrome plated post. Sliding roller arm makes raising and lowering very easy.
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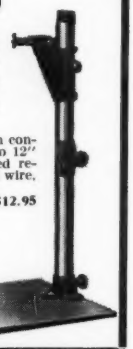

Copy lights (*not illustrated*) used in conjunction with above consists of two 12" flexible arms with parabola shaped reflectors. Complete with sockets and wire, slips easily onto copy stand post.
No. 23 Copy Lights.....$12.95

FREE CATALOG available of above items plus **Tripods, Enlargers, Darkroom Items** • Write Today.

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NEW PRODUCTS

(continued from last page)

with Quik Splice Mylar splicing tape, a pre-sprocketed, self adhesive plastic tape. The new unit, the HPI Pro-Splicer, uses stainless steel cutting blades and is furnished with a supply of Quik Splice tape. The unit is $9.95. Additional splicing tape is 79¢ per package.

Negative File 101

Nega-Tubes, produced by the Nega-File Co., contains transparent acetate sleeves to protect strip negatives, and permit enlarging of negatives without removing from sleeves. Made in all popular roll film sizes, Nega-Tube consists of a heavy Manila file envelope and enough acetate sleeves to hold an entire roll of film. For 35mm storage, film is cut into strips of 6.

New Yashica 102

The new Yashica is a 2½ x 2¼ twin-lens reflex with conversion kit for 35mm film. Has Yashikor 80mm f/3.5 taking and viewing lenses and a Copal MX shutter with linear speeds from 1 to 1/500 sec. and B; self timer. Other features are a semi-automatic film advance; sportsfinder and focusing magnifying glass; clear spot in ground glass for accurate focusing; rewind knob for 35mm. Price with 35mm conversion kit is $69.95.

New 35mm 103

A new 35mm rangefinder camera, the Petri Automate f//1.9 has an Orikkor 45mm f/1.9 seven-element lens with stops to f/16. Behind the lens shutter with speeds from 1 to 1/500 sec. and B; MX synchronization. Other features include single-throw shutter cocking and film advance lever; single window range-viewfinder with bright line framing. Price of the Petri is $99.50.

Film Dryer 121

You immerse washed film in a bath of D-Vel-O Film Dryer for 2 min., squeegee the film and it's dry instantly, according to D-Vel-O Pill Corp. Besides readying film for printing immediately, the manufacturer claims these benefits for the new liquid: hardens emulsion and makes film more pliable without causing shrinkage; reduces tendency of film to build up static electricity; makes film more resistant to scratches. Price: $3.95 a quart.

Filter Safes 122

New Tiffen leather filter safes hold six filters in protective dust-free sections. The color on the rim of each filter is readily identifiable for quick selection. Prices: Series #4 (or 2.1-mm), $1.75; Series #5, $1.95; Series #6, $2.25; Series #7, $2.95; Series #8, $3.95; Series #9, $4.95.

Kodak Dry Film Splicer

The Kodak Press Tape Splicer makes dry and interlocking splices on 8 and 16mm movie film. The splicer cuts a notched section out of one frame and a corresponding notch out of the other and the two pieces of film are fitted together. Two finger hooks on the splicer anchor each piece of film in position during splicing with adhesive Kodak Press Tape on both sides of the film. Price of the Kodak Press Tape Splicer, with a supply of Press Tapes, is $6.95. Additional packets of 50 Press Tapes, either 8 or 16mm, cost 50¢ each.

Kodak 500 Slide Projector

The Kodak 500 slide projector has an Ektanon 4-in. f/3.5 lens and a vinyl-clad, all steel body with die-cast and panels. It uses the Westinghouse 500-watt ASA code DBJ lamp in Focus-Lok base with an actuating lever on the lamp socket for detaching the lamp. The condenser system includes a separate heat absorbing glass for cooler operation and 35mm, Bantam and super slides may be projected without change in the condenser system. The 500 is available with either the Kodak Readymatic changer or an automatic magazine changer. Price of the Kodak 500 with Readymatic changer is $74.50; with the automatic changer, $84.50.

For additional information on any new products item, circle the readers' service card at-

the readers service card attached to page 59

Two New Contaflexes 123

Two new additions to the Zeiss Ikon Contaflex 35mm single-lens reflex line have been announced by Carl Zeiss, Inc.

The new Contaflex alpha is fitted with the convertible 45mm Pantar f/2.8 lens and a Prontor Reflex shutter. It has a self-timer and speeds to 1/300 sec. The Contaflex beta, with the same optical and shutter equipment, has a built-in photoelectric exposure meter.

Accessories for both cameras are Pantar f/4 component lenses of 30 or 70mm focal length. The Contaflex alpha is $126, the beta $149.

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CAPACITY 150 8x10 S W PER HOUR
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Get more information. Circle 433, page 59

MACRO AND MICRO

(continued from page 27)

up a standard coupler with a built-in shutter. The female end of this coupler, containing the shutter, mounts onto the lens board. The male end is built to fit standard microscope tubes. This type of connector hooks up a camera to a microscope in seconds; shutter speeds are usually $\frac{1}{100}$ to 1 sec., plus "bulb."

A much simpler device (for the man who does this work on rare occasions) is to mount an adjustable diaphragm-type lens clamp on a lensboard. When you are ready for photomicrography, merely close the diaphragm down on the microscope tube to exclude all extraneous light, focus the microscope to produce an image on the ground glass of the camera and shoot.

The light touch

Lighting is critical. Moving a light as much as $\frac{1}{16}$-in. may produce a tremendous change in picture results. The photographer has to learn to cultivate a light touch. Fortunately, special lights are designed for this type of work and every phase of lighting, and composition is completely visible on the ground glass. If there's a microscope around, there's usually someone around who knows how to use it well enough to help a photographer get set up and started.

Because of greater magnification and variation in the amount of transmitted light, exposure calculation is more difficult in photomicrography. Special exposure meters are made to read through the eyepiece of the microscope tube. More convenient, I find, is an electronic Welch Densichron for with it I can take readings right off the ground glass. If the ground glass image is bright enough, a Weston or other reflected light meter can be used effectively with some practice.

Where no meter or shutter is available it is advisable with medium speed films to make a series of exposures from 5 sec. to 1 sec. for dark images in the ground glass, and from $\frac{1}{10}$ to 1 sec. for light images. Exposure can be timed simply by using a dark slide to chop off the light which enters the mirror of the microscope.

The approach

Getting a big picture of a small area is not enough. Before setting up for an assignment of this type find out all you can about the purpose behind the picture and the nature of the subject—then think about it for a while. THE END

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by Arnold Eagle

INDUSTRIAL MOTION PICTURES

Making light of movie lighting, with some warnings to still men

Lighting is the cameraman's function. To save effort and time he should have a plan in mind when he sets up his lights, and even before he turns on the juice he should know what his lights will do. Although experimenting and moving lights is necessary with every setup, the cameraman can save a lot of time if he knows what he wants beforehand.

Special problems

The still photographer who has experience with multiple flash has an advantage in this work because he has learned to judge the precise effect of his lights *before* he sees the developed negatives.

There are other aspects of movie lighting in which the still photographer can put to use his previous experience, but there is one great difference between lighting for still pictures and lighting for movies. In still photography the cameraman has to set up his lights in such a way that his subject will look well for only an instant—while in movie lighting the subject has to be properly lighted for the whole take. He has to be well lighted when he turns his profile, looks down or walks across the room. So every take must be rehearsed for lighting exactly as it is going to be shot. The cameraman has to concentrate to see that his lighting setup is functioning properly, that there are no disturbing shadows at any time and that the exposure level is correct in every position. For instance, a subject may be 11 ft. from a light at the start of a shot, but when he moves 6 ft. in the direction of a light there may be five times as much light falling on him.

The cameraman always has to make some last minute changes in his lighting setup after he observes the action. At that point he may change his lights or change the action—if he is director as well as cameraman. Otherwise he might explain his problem to the director and suggest a change in the action if that would not interfere with the meaning and effectiveness of the shot.

In location shots as a general rule the lighting should recreate the original lighting conditions as closely as possible. Naturally, the cameraman can take certain liberties to make it more dramatic and interesting, but it's up to him to use judgment and good taste.

Still photographers starting to make movies might forget that lighting must be matched throughout the various shots of a scene, especially during medium and close-up shots. Your audience will be confused if you have a main light coming from one direction in one shot and then have the light come from the opposite direction in the following shot of the same subject.

Make it uniform

Another important factor in film lighting is to have a continuity of lighting throughout the action in one location. Furthermore the character of the lighting should be similar throughout the whole movie. It is a good practice to visit the location and make a rough sketch of the camera position and the number and location of necessary lights. This will be a great time saver when the actual shooting starts.

Because it is one of the creative aspects of film making, there are no hard and fast rules for lighting. It depends on the character and mood of the film being shot. Most professionals, however, do have a system for setting up their lights. First, they set up the key lights: one or a group of lights usually the brightest light on the subject, coming from one direction. Next are the fill-in lights. These soften the shadows and reduce contrast. Back or rim lights complete the lighting on the subject. These are usually spot-

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lights directed from behind which help to separate the subject from the background. Then he may use background lighting. This is especially useful in color photography, without it the background may go completely dark. The background lighting also helps to do away with shadows.

In film lighting a number of light sources are used. When the subject moves, multiple, moving shadows cast on the wall can be very distracting. They can be overcome by having the front lights high enough for the shadows to fall low or on the floor, or by swinging front lights somewhat to sides of the subject so the shadows fall outside camera range. Pouring light on the background will also wash out shadows but a blank, bright white background is usually dull looking in motion pictures. To avoid this difficulty, many workers put objects formed in special designs, such as a venetian blind, in front of the background light to create interesting shadows on the wall.

Lighting equipment for movies falls into two main categories, spotlights and floods. Professional film makers usually prefer spotlights for keylighting and backlighting because the spotlights can be concentrated in a smaller area, can be used effectively further from the subject than floods and can be directed so they do not shine into the lens of the camera. A floodlight is used mainly as a fill-in or to raise the general illumination of the set.

Many industrial film makers make great use of reflector floods used as clip lights while on location. These have many advantages over the bulky standard spotlights and broads (floodlights). They are portable and draw much less current, so they can be used on regular light circuits. They are most useful in floodlighting an area. Reflector spot bulbs help in concentrating light in one spot, although they are not as effective as regular spotlights because the beam cannot be regulated.

Another favored light for location shooting is the low wattage bulb used with a step-up transformer, which enables a 150-watt bulb to give the light of a 500-watt bulb.

With the advent of the fast film a new type of lighting is being used on location. It is the reflected or bounce technique. A few lights are bounced off the ceiling. The result is a diffused, relatively shadowless and natural looking illumination. On a location where a low ceiling is available it can be a quite effective and very economical way of shooting motion pictures. THE END

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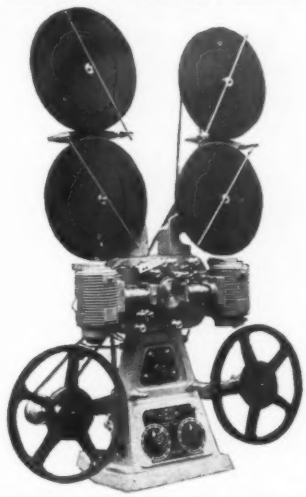

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IN-PLANT TEST

Simmon Omega Tri-Color Computer under examination, comes through tough test with flying colors (Type C of course!)

SPECIFICATIONS: Simmon Omega Tri-Color Computer, system for exposure computation and color correction of projection prints on Kodak Print Material, Type C. Principal elements are the following.

First, an automatic filter turret which is placed under the enlarger lens. It includes a photocell to measure negative density; a red, green and blue filter; an opening for white light projection for focusing; an electric motor to swing filters in timed sequence for the tri-color exposure.

Second, a Computer with a voltage stabilizer for the enlarger lamp, and a number of controls which are coordinated electronically to alter the exposure of the paper. Among the controls are: adjustment for negative size and for magnification ratio, balance for emulsion batch of the paper, density correction, adjustment for illumination of the original scene (flash, sunlight, speedflash etc.), two stages of corrections for the color balance of test prints.

Third, a Comparator. It is a balanced illuminator with a 28-position filter wheel. Test prints are viewed through the filters to indicate in numbers the hue and density of correction required for test prints. Information derived from it is dialed on the Computer for exposure of the final print.

Fourth, a test easel which permits making a test exposure of one-fourth of an 8 x 10-in. sheet of paper while protecting the other three-fourths from the light. Price of the four-unit system is approximately $2,000.

Joseph Brehmer of Meteor Photographic, Detroit, reports: We have been working with the new Simmon Omega Tri-Color Computer for about eight weeks, and have put this unit, the first of its kind in the color photoprint field, through every conceivable test in our lab to determine its accuracy, versatility and, of course, speed of operation. We feel it should be rated on its ability to do all these things efficiently.

The first step is to balance the unit's circuitry to the particular emulsion batch on hand. Once the emulsion is "balanced out," by adjusting primary controls to reproduce a grey test negative, it is a simple matter we find to go through quantities of Ektacolor and Kodacolor negatives in the first or the proofing stage.

These color proofs are inserted in the Color Comparator one at a time to determine the amount of color correction required. The Color Comparator is a viewing device with a combination of 28 filters. The filter combinations are rated with a numerical valuation which can be fed back into the computer. Viewing is done by rotating a filter disc slowly over the lighted test print until you find the combination that gives the best color balance. The system is quite accurate. You get a remarkably close preview of the finished print.

We feed the information on the amount of correction required for the color and general density of the print into the control panel of the Computer. The resulting print is, in most cases, fully acceptable. The correction system utilizes combinations of any two of the three color primaries. However, if a correction for the third primary as well is necessary, the Computer is equipped with a second stage of color control, based on an analysis on the Comparator of the first corrected print.

We find that in changing magnification, the Omega Computer is amazingly accurate. Once a small test print (4 x 5) is made on the Computer, the factors of negative density, degree of enlargement and color balance are correlated automatically and electronically. The

Comparator doing its stuff.

Computer removes guesswork.

Computer then actuates three color filters in a correctly timed sequence of exposures.

Trial prints are made quickly and economically using the trial print holder which accommodates four exposures on an 8 x 10-in. sheet. The trial print holder resembles an easel. It has a movable interior paper holder which permits separate exposures on four sections of the 8 x 10-in. sheet. Any negative can be proofed this way regardless of magnification required for the finished print.

The tri-color method used in the Computer system is ideal for Type C printing, we feel. It offers increased color saturation, sharp images and finished prints with a custom printed look that we have yet to obtain by the "white-light" method of printing. We say the Omega Computer system will enable you to get the most out of the Type C material. It is, we believe, the solution to the mystery of how to eliminate costly tryouts, borderline prints and eye-straining print examination through CC filters. THE END

EXPOSURE INDEX

(continued from page 41)

and less careful worker from getting under exposed negatives?

When *Exposure Index* was defined as Speed/4 black-and-white negatives could be overexposed by two lens stops without serious damage to the quality of the image. Today, however, overexposure leads to contrasty shadow rendering and flat middletones and highlights. Moreover, the inherently steep recording characteristics of many films today in the low exposure region permits a greater under-exposure tolerance. This, combined with the fact that many films now increase in effective speed rather rapidly with increases in development, without becoming excessively steep in contrast, means that a safety factor in the exposure index is hardly required.

Was the high safety factor ever justified? It did bring the ASA speed values somewhat in line with the film speed ratings published by the exposure meter manufacturers, but this was not necessarily a good scientific reason despite its possible commercial justification. When one considers that exposure indexes published for color films are used with a great measure of success by photographers of widely divergent talents and experience, without embodying a safety factor, it seems as though the risk of under-exposing with typical camera equipment has been overstated.

What can be done about it?

It would be convenient if a statement could be made to professional photographers such as, "Multiply the ASA exposure index of a film by 4.0 for determining camera exposure if the film is to be developed normally. By 6.0 if development is extended 100%." But the subject is not so straightforward as to allow blanket multiplying factors to be applied. With many films still in use some order of safety factor is desirable. Errors do occur in even the best photographic circles and manufacturing tolerances have to be considered. However, the safety factor of 4.0 now in the ASA Exposure Indexes could be reduced to 2.0, which would double the effective film speed of black-and-white films generally. Of course, this assumes careful technique and reliable equipment. For films of the newer types that have steep contrast in the low exposure regions the safety factor might be lowered to 1.5 or, if development is extended somewhat routinely, to 1.0. THE END

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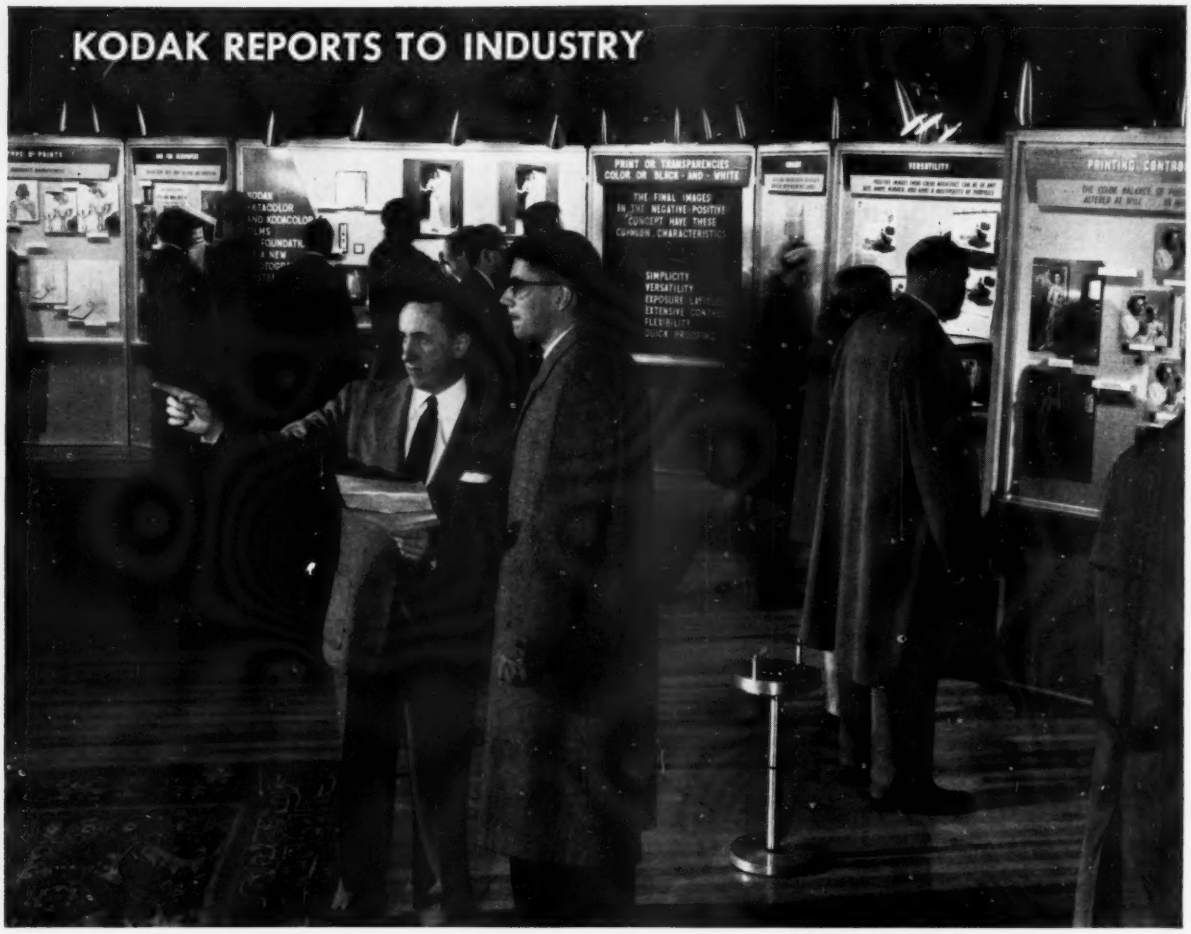

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MADE TOGETHER TO WORK TOGETHER

The negative-positive color system makes this versatility possible because its elements—film, chemicals, and print materials—are all made together to work together.

The new Kodak Ektacolor sheet film comes in two types. Type S is for exposures of 1/25 of a second or less. Type L is balanced for longer time exposures under normal studio lights. For roll-film cameras—116, 120, 616, 620, or 828—Kodacolor is the answer. Kodacolor Film yields magnificent Type C prints. Or negatives can be printed as transparencies on matching Kodak Ektacolor Print Film.

Finally, with Kodak Panalure Paper you get black-and-whites of excellent quality from these color-negative materials. And you use nothing but regular black-and-white processing methods!

If the Kodak Color Road Show comes anywhere near you (see box below), make a firm date to see it. If you can't make it, ask your Kodak Technical Representative to fill in the facts for you. It will mean the start of a new age of photography for you!

MAY-JUNE DATES OF THE KODAK COLOR ROAD SHOW

Seattle
Olympic Hotel.....May 7

San Francisco
Sheraton-Palace Hotel...May 13, 14

Los Angeles
Hollywood Roosevelt Hotel.....May 21, 22

Dallas
Statler Hilton Hotel.....May 27

Atlanta
Dinkler Plaza Hotel.....June 3

Toronto
Royal York Hotel.....June 11, 12

Montreal
Windsor Hotel.....June 17, 18

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